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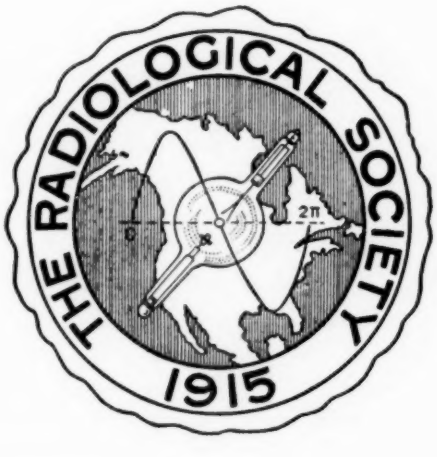

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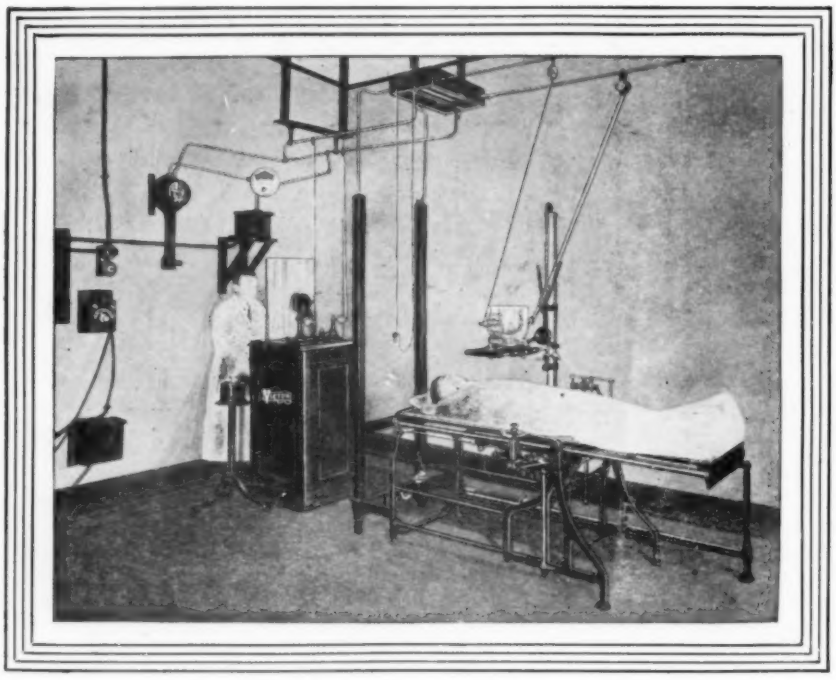

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The Progression of the Chest and the Determination of the Normal---A Preliminary Report*

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Denver

MR. CHAIRMAN, it is again my privilege to address this society upon a subject which forms a no small part of our specialty as radiologists. And likewise, the diseases of the chest form a no small part of the diseases of the body as a whole. The success in treatment of many of these same diseases depends upon early recognition by the x-ray. With this in mind I beg your permission to restate certain facts, that they may receive what would seem to be proper emphasis, and recount certain others from the most excellent history of radiography. In addition I wish to propose still another method for the study of the chest—a method that to me would seem to offer some promise of a greater understanding of our problems.

In looking through pictures taken even as early as 1897, it is rather disconcerting to see what excellent reproductions were obtained. It is true that these were the unusual, whereas today the results are more uniform. But it does seem that the average of the present time should be much above the exception in the early days of radiography. This may be explained by the wide range of the present day radiograph and the varied and new fields into which the radiologist has had to enter. We have hardly had time to work out all the problems peculiar to any one part of the body.

In making a recent survey of the literature it would seem that the first radiograph of the thorax was probably made in 1896 by Doctor Arthur W. Goodspeed, with an exposure of forty-five minutes, showing at least good bony detail. A few months later this exposure was reduced to one minute by his assistant. Developments in technique were very rapid and in 1900 Doctor Francis H. Williams reported very excellent pictures of the chest taken in two to four minutes. The fluorescent screen was used at a correspondingly early date and Williams is given credit for showing an ingenious fluoroscope, before the Association of American Physicians on April 30, 1896.[1]

It soon became evident to these early workers that the radiograph of the chest must be taken with a very short exposure, so that Rieder and Rosenthal in 1905 reported before the Roentgen Congress in Berlin, skiagrams of the thorax taken in one-tenth of a second. The reproductions made from these originals are really very excellent. It is interesting to note that in 1911 Rieder was taking his chest pictures in one to two seconds, while in 1910 Dessauer reported a new method for taking the same pictures in one-fiftieth to one one-hundredth of a second. It would seem that these very short exposures were taken by special apparatus in laboratory experimentation and were not carried out to any extent in actual practice. Doctor A. Howard Pirie, in making a survey of the German laboratories in 1911, reported that these same workers were making their chest radiographs in two to three seconds. Robert Knox in his text of 1917 states very emphatically that a chest radiograph made in greater than one-tenth of a second has very little diagnostic value, but we are unable to get further reports on his work. Of the Americans, Doctors Dunham, Orndoff, Caldwell, Cattell, Pfahler, Hirsh and Alden Williams have done considerable in developing the chest technique, and I know that many others have never published results of many long hours spent in this experimental work. In 1908 Rieder and Rosenthal reported chest radiographs made upon a special film by means of double intensifying screens, but later discontinued the use of screens. Doctor Mackenzie Davidson reports the use of stereoscopy in the interpretation of x-ray photographs as early as 1898.[2]

This survey tends to prove that a definite need for short exposures does exist, and has been felt by the careful workers. And it is my opinion that the present generation realizes the importance of this factor. But the average radiologist considers this procedure as being either too difficult, too expensive, inconvenient, or not practical for routine. It is for this reason that I wish to speak rather frankly of my own experience.

After a review of considerable material, I began in 1916 to realize that cases were sent to my office not to learn whether any infection existed, but rather how much gross pathology was present. Feeling rather humbled by this realization, and without the information of what other workers had done, I set about to solve this difficulty, and from fluoroscopic and radiographic observations, noticed that chest radiography had certain natural advantages as well as disadvantages. Of the former, I might mention that we are dealing with air, fluids and solids, each of which has its own resistance to passage of the roentgen ray and therefore affords a great deal of contrast. The pleura and the connective tissue septa around the smallest lobules quickly thicken under the slightest irritation and offer resistance to the ray, while the lymphatic drainage along the bronchi undergoes similar changes. The outstanding disadvantage is the movement of the intrathoracic viscera. Also, the chest is barrel-shaped, giving overlapping of structures and is held away from the plate by the muscles of the back, and the breast in front.

After a year's trial with short exposure and double intensifying screens I endeavored to set forth before this society, in 1918, certain views which I obtained from this work. Later, in a series of articles, I described the advancement and the various phases of chest radiography as I encountered it.

Today, after five years' experience in all classes of work, I feel free to state that this method is practical, and not a mere novelty in laboratory pro-

*—This work is being made possible through the aid of the Selmene Winter Foundation. Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 7, 1922.

cedure. Neither is it more inconvenient, certainly not difficult, and only slightly more expensive.

To me it has meant that cases are now sent not for survey as to gross pathology but for a minute study of the lungs. Certainly we have not overcome all the disadvantages, and much is left to be done in the future. I know that others in this country have taken up this work and that their conclusions are similar to mine, but the percentage in comparison to the number of radiologists is woefully small.

The advantages of the present day apparatus, if properly utilized, would be a tremendous, if not a deciding factor in the fight against tuberculosis and other diseases of the chest.

After the development of a technique which we know from clinical and pathological observations shows very minute changes from the normal anatomy into the pathological, there comes a crying need for a greater knowledge of these processes. As we turn to equip ourselves with this information we are rather at a loss as to how to get it. There have been two main methods of study, the pathological at the postmortem table, and the clinical. The literature has been reasonably full of information gained from these methods, by the investigations of numerous workers, but Doctor Dunham has done the most by his consistent and continuous efforts, to bring us to definite conclusions. Ghon's book was enlightening and from the clinical standpoint we have had observations from numerous sources. There has been a third method used to a lesser extent—namely, the x-raying of a group of cases selected at random. All three are very important for our final analysis and yet inconclusive. After such studies we still feel unfamiliar with the minute processes that occur in the chest.

The radiograph is the portrayal, upon an emulsion, of the normal anatomy and its physiological and pathological variations. It does not seem proper that our study of any individual film should begin with the pathological, but rather should begin, as does a pathologist in studying a section, with the normal anatomy and follow its changes over into the pathological as shown upon that particular film. Life is a series of actions and reactions, and there is no place where this history is registered to better advantage than in the lung structures. These actions and their re-actions do not begin at six, twelve, or fifteen years of age, but at birth. The marks of these struggles must be taken into our consideration along with the normal evolution and development. The home environment, occupation, residence and habits as well as infection and injuries are factors as to what a given chest will show up on a radiograph and begin their influence early in life. Also in the process of development there is a normal tendency toward a fibrous change. All these influences and tendencies, together with the usual infectious diseases, when considered as a whole are quite normal, if the reaction balances the action, and for this we have chosen the term *progression*. It is a progress quite definite in character but with no definite termination. What is normal for one child may not be normal for another, and it does not seem proper if we have a bronchus in a certain place or a hilus of a certain width that we should call these normal or pathological, but rather that we endeavor to study the character of any individual shadow. It would then seem that further data as to this progression might be of some help. With this in mind we began, one year ago, the study of children from the time of birth. Each child is radiographed within the first two weeks after birth and then radiographed successively at frequent and stated intervals, with close study as to the clinical findings, the family history, home environments, and any factor that may be of any influence on the child's life. Radiographs are taken after illnesses, such as the usual childhood infections. These children are coming from all classes of society in our city so that we must also make group studies at various ages from children on the streets. And as the chest diseases of our city tend toward tuberculosis, certain pathological postmortem observations are also accessible. The serial study of chests is coming into greater favor and certain men now recommend it as very important in the making of definite diagnoses. The technique will be that necessary to overcome the difficulties previously described.

With your permission, I hope at a future meeting to give you my data as it is made, that I may have your discussion and conclusions.

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Surgical Diathermy in Its Relation to Radiotherapy*

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Chicago

SURGICAL diathermy comprises the application of destructive heat to animal tissues and structures, which heat is produced by high frequency currents. It is not a direct application of electricity; by virtue of the numerous reversals of the electric current all physiologic actions as electrolysis or the excitation of excitable tissues are eliminated. The heat is either produced by the spark due to the closing and interrupting of the current or by the resistance that the animal tissues offer to the current forced through them.

The modern diathermy apparatus are constructed in such a way that, though of low voltage (2,000 to 2,500) an amperage of up to 5,000 milliamperes may be reached. This simplifies matters considerably. While all the necessary destructive heat may be developed, complex insulation of the patient and operator and the use of specially constructed nonconducting retractors become unnecessary—precautions that had to be minutely lived up to with the old fashioned apparatus of high voltage.

Destructive heat always has had a recognized place in the surgical armamentarium especially in dealing with malignant growths, that for some reason were not deemed fit subjects for the knife.

The advantage of surgical diathermy in this field of operative endeavor is two-fold, technical and clinical. Its superiority over the Paquelin, the soldering iron and the galvanocautery is based upon essential items.

Surgical diathermy guarantees an orderly procedure of coagulation without any incidental interruption, which is so frequently observed during the use of the appliances mentioned above, and which is caused by the cooling off of the instrument or by the resistance of the scab formed by the burning. The increased resistance of the scab and the subsequent non-accessibility of the deeper structures is overcome in diathermy by increasing the current, and above all, the extension of the coagulating effect as to surface extension and penetration may be gauged accurately

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and is entirely within the control of the operator.

There is no technical limitation for the extent of coagulation produced by the high frequency current and the same holds good in respect to the anatomic qualities of the tumor to be destroyed, while the limits of the successful employment of the actual cautery are pretty soon reached if one has to deal with a large, spongy, well vascularized growth. Another consideration will also militate in favor of surgical diathermy.

The destruction of a pathologic structure by the actual cautery, if of any considerable extent, implies the same danger as an extensive burn of a normal tissue. Extensive burns are apt to lead to a flooding of the system with the products of burning which either produce severe general symptoms or in certain instances cause the development of dangerous, occasionally fatal, ulcers of the intestinal tract. This danger is eliminated by the application of electrocoagulation since the lymphatics around the coagulated area are immediately and thoroughly sealed, and any secondary absorption is thus prevented.

The indications for surgical diathermy expanded with the development of the technique and the immediate results improved. Soon, however, the fact became apparent that the paramount issue in electrocoagulation of malignant tumors lies in its conjugation with radiotherapy.

For quite a while it was an accepted thesis among roentgenologists, that therapeutic results were better, if the raying was applied to hyperemized structures, and a favorite method of producing this hyperemia was the employing of "medical diathermy," the attracting of blood to the structures concerned by heating them moderately but thoroughly with the help of the high frequency current.

Then Pfahler pointed out that practically unmanagable epitheliomata of the face and skull would heal under x-rays, provided that electrocoagulation was employed previous to raying. But it remained for observation of a series of vesical and uterine cancers to demonstrate that, administered under certain conditions, surgical diathermy is the most efficient preceding factor for improving the healing effect of radiotherapy.

After disagreeable experiences with total coagulation of the tumor mass in extensive cases of uterine, vesical and prostatic cancer only limited coagulation was executed in cases of this type and this interference was followed up by raying either with radioactive substances or with the roentgen tube.

The reasoning was that only the tumefaction of the involved organ should be coagulated by diathermy, while the involved vesico-vaginal or vesico-rectal septum should be left to the therapeutic influence of the rays. In case the raying should be successful, then the substitution of fibrous tissue for the malignant mass would furnish a healthy septum and thus the formation of pathologic communications between vagina, bladder and rectum would be avoided.

In the course of further observations it was noticed that raying applied shortly after electrocoagulation seemed to furnish better results than radiotherapy administered some time after the diathermy.

It therefore became the routine to coagulate malignant tumors only to a limited extent, and to administer the therapeutic rays within forty-eight hours after the electrocoagulation. In this way very satisfactory results were obtained—even in apparently hopeless cases clinical cures were accomplished —the term clinical cure is chosen because the oldest uterine case is only five years old and the oldest vesical case is of three years duration without relapse.

The partial coagulation of a malignant tumor certainly cannot be held responsible for the disappearance of the entire growth, the same may be held concerning the raying, even if one believes in the "carcinoma dose," because in the uterine cases only one hundred milligrammes of mesothorium or radium were used for twenty-four hours, and in the vesical cases two hours under a 25,000 volt machine were administered in one, and only one, seance.

In order to explain these therapeutic successes it is necessary to deviate some from our traditional conceptions.

Well substantiated doubts may be offered concerning the supposedly direct destructive action of therapeutic rays on tumor cells. If the curative element were a direct action it would follow that in each instance the rays should make an impression on a malignant tumor, which happens however in only a small minority of such cases.

If under the influence of therapeutic rays the cancer cells simply would disintegrate and the products of this disintegration be eliminated, then the raying of a cancer should increase the elimination of nitrogen, which is not the case. It is furthermore conceded by the biologists that only a functioning cell may bring about a disaminization, a decaying one is unable to do so.

It seems more along the lines of sound reasoning to assume that under the influence of therapeutic rays tumor cells may produce materials, that, if brought into the circulation, in turn excite other cell groups into the production of defensive and inhibitory ferments which put a stop to the form of activity of tumor cells which we call malignant luxuriation.

There are other facts that place this ferment theory beyond idle speculation. It is a matter of experience that if a malignant tumor is rayed and the blood of the carrier is taken during the general reaction and is then injected into another patient who is suffering from cancerous cachexia the second patient will show marked improvement.

It is not too far fetched to assume the raying produced defensive ferments in the donor, and these, if injected in the second patient, evolve an inhibitory action on the materials emanating from decaying tumor cells, which materials are the producers of cachexia. This ferment theory is also supported by another observation. It will occasionally happen that under the influence of therapeutic rays a malignant tumor will show intense and rapid luxuriation. It is a fair conclusion to assume that in such an instance the production of stimulating ferments outweighs the production of inhibiting ferments, thus causing a rapid proliferation of the tumor cells. In support of the ferment theory it may also be noted that therapeutic rays show a pronounced, favorable influence on localized tuberculosis, although the germicidal action of roentgen rays is practically nil.

That antitumoric forces exist in the human body is proved by the fact that in healthy individuals a fatty acid may be traced in the blood serum, which acid is indifferent to normal structures but shows carcinolytic qualities. In carriers of cancer, however, there is to be discovered another, a saturated fatty acid that counteracts the carcinolytic acid at a ratio of ten to one—an example of a struggle between two substances concerning the luxuriation of a cancer.

In dogs the removal of the thymus reduces the carcinolytic potency of the blood serum, while in rabbits for instance, the carcinolytic quality of their blood serum is increased by the hypodermic injection of thymus taken from the calf.

This observation illustrates the influence of endocrine glands upon the growth of malignant tumors and may help explain the fact that in human beings advanced age shows a disposition toward development of cancer, one of the contributing causes being the partial obliteration of the thymus.

Investigation of the immediate results of surgical diathermy has demonstrated that beyond the zone of ne-

crosis and sealing of the lymphatics there is created a zone of pronounced reaction, an area of aseptic inflammation, characterized by the appearance of abundant round cells and leukocytes together with the production of fibroblasts. All these are cells of high vitalistic function—it was also found that the cells composing the fibrous tissue became energized—this is proved by the fact, that these energized fibrous cells accept vital staining which they do not under ordinary conditions. It is fair to assume that cancer cells lying in this perithermic zone also become energized.

Under this increased vital potency they may produce materials which if brought into the circulation may by their systemic influence stimulate the endocrine glands to the production of defensive and protective ferments, apt to tone down the excessive luxuriation of a malignant growth.

These biologic considerations together with the clinical observations may suggest that only the decayed and decaying malignant cells ought to be destroyed by surgical diathermy, while the malignant cells that are still at the peak of their periodicity of life should be left to the influence of radiotherapy.

SUMMARY

Surgical diathermy is a potent factor enhancing the efficiency of radiotherapy.

Electrocoagulation and raying seem to furnish the possibilities of a true chemotherapy of malignant tumors.

Raying has to be administered while the perithermic zone shows pronounced reaction.

On the Physical Principles of the Alpha Ray Therapy*

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FROM the experience with x-rays and the rays of radium, it is now generally known that the specific biological effects of rays are proportional to the energy absorbed in the tissue. This holds for any sort of radiation. Absorption of the energy of rays is accompanied by ionization and if there is a means to measure the ionization of the beam of rays entering a certain growth and the ionization after having passed through this growth, it can be calculated what amount of radiation (measured in terms of energy) was absorbed by the growth in a known time of exposure.

Since the absorption of certain types of radiation in tissue is well known, the applied dosage can be measured also by the amount of incident radiation. However, it should be borne in mind that not the amount of incident radiation in a certain part of the tissue, but the amount absorbed per cubic centimeter is decisive for the biological effects.

Referring to rays from radioactive substances, it is well known that the alpha, beta and gamma rays differ widely in their power to ionize or to produce chemical and biological effects.

From the measurements of the heat produced by radium and its successive products,[1] the total energy of the three types of radiation can be deduced. It was found that when one gram of radium with its successive products, emanation, RaA, RaB, and RaC, is used, the α-particles and recoil atoms produce 123.6 gram-calories per hour, the β-rays (electrons) give an amount of 4.7 gram-calories per hour, while the γ-rays give 6.4 gram-calories per hour.

If in medical work γ-rays alone are applied, it can therefore be stated that about 5 per cent of the energy of radium is used while 95 per cent of the energy is absorbed and converted into heat within the preparation, the glass, and the walls of the filter used.

If metallic needles filled with radium salts, or tiny little glass tubes with emanation, are applied within the human tissue, a great part of the β-rays passes through the walls and acts upon the living tissue. But even in this case where β- and γ-rays are used, the amount of radiating energy which is applied usefully does not exceed 11/135 of the total radiation, as can be seen from the figures given just above. Thus it is clear that in applying radium or emanation in sealed thin containers, even when buried within the tissue, we have available little more than 7 per cent of the total energy emitted by radium in the form of rays of all three types.

More than 90 per cent of this energy is sent out with the α-particles. These have a very high ionizing power but cannot even penetrate a glass tube the wall of which is 0.5 mm. thick. Therefore, all these rays are readily absorbed within the crystals of the radium salt or in the walls of the container.

In air of atmospheric pressure, α-rays can travel several centimeters; α-rays of RaC having a velocity of 19,200 km. per second traverse 7 cm. of air before they lose their ionizing power. Slower α-rays, like the α-rays of radium itself (15,000 km. per sec.) traverse not more than 3.3 cm. in air before they lose their ionizing quality. Accordingly 7.0 and 3.3 cm. are called the "ranges" of the α-particles of Ra C and of Ra. The fastest α-particles are those of thorium D; they have a range of 8.6 cm. in air.

The enormous difference between the respective ionizing powers of α-, β-, and γ-rays is well known. Disregarding the differences in ionization at the beginning and at the end of the path of an α-particle, it can be said that approximately 30,000 pairs of ions are created in every single centimeter of the path of an α-particle in air. The more penetrating types of β-rays create not more than 80 to 300 ions per cm. of their path in air. Gamma rays produce 1 to 2 pairs of ions per cm. of air.

Ionization and biological action seem to go parallel, as far as we know. It might therefore be very effective to utilize the intense ionization produced by α-rays for therapeutic purposes. An external application of radium could never serve this purpose. Experiments have been made with flat radium applicators using very thin mica screens, but even when the α-rays passed through the mica window they could not penetrate the human epidermis.

The range of α-rays in solid and liquid substances is extremely short. The α-particles of Ra C having a range of 7 cm. in air, are stopped in glass at 0.04 cm. distance. In water and other liquids of about the same stopping power they have a range of about 0.06 cm. The α-particles of the other elements of the radium family are much slower. In the average they would not traverse human tissue beyond a depth of .05 mm. This is a great obstacle in the way of using them for therapeutic purposes.

Open radium crystals which give off a certain amount of α-radiation should not be buried in human tissue and even the thinnest possible screens would cut off more than 90 per cent of the α-rays. This is the main reason why α-rays have not been used for therapeutic purposes to any great extent.

Nevertheless there are several ways of applying α-rays to the human body which are physically possible.. One of them has been in use since the infancy

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of radiology, i.e., the use of radium emanation in inhalators and for bathing and drinking. In all these cases a radioactive gas with a strong α-radiation is mixed with air or water passed through the body. Another method consists of intravenous injection of small quantities of radioactive substances in solution. The latter method was developed mainly in this country and will be discussed later.

In both cases the biological effect depends upon:

(1) The time of exposure, or in other words, the time the radioactive substances are acting in the body. This in turn is dependent on the radioactive decay of the substance used.

(2) Specific absorption of the radioactive substances in certain parts of the body.

(3) General circulation of the system.

Two other possible ways of internal use of radioactive substances may be mentioned: Administration per os and per clysma. In these cases the solution containing radium emanation, thorium X, or other substances, passes through the digestive system in a relatively short time. The radioactive substances can hardly affect the living cells by direct α-radiation, because α-rays are absorbed in the liquids covering the mucous membranes.

On the other hand, it is very doubtful whether β- and γ-radiation of small quantities of radium emanation, etc., as they are used internally, have any noticeable effect. Only experimentation can show whether or not sufficient quantities of the substances pass into the lymphatic system.

It can be foreseen that only a small fraction of the swallowed substances remains in the system. In drinking radium water a very large part of the emanation is ineffective for the same reason. Furthermore, exhalation and the process of swallowing undoubtedly remove a very large fraction of the emanation from the system.

If emanation is inhaled, the lungs are filled with a certain quantity and the radioactive deposit (RaA—RaC) is formed on the inner surface of the lungs. Here certainly the α-rays can act biologically to some extent. But the main action of these rays takes place within the blood. Blood absorbs emanation to about the same extent that water does[2] and it has been shown by different observers that in persons who are exposed to emanation for several hours the blood contains a certain amount of emanation.

The elimination of emanation is completed two to three hours after the patient has left the "Inhalatorium." Exhalation removes practically all the emanation. A very small fraction of emanation is eliminated through the renal system (Lagneur).

Entirely different is the effect of the intravenous injection of radioactive substances like radium, thorium X, polonium. Thorium X decays in 3.6 days to one-half of its original value, polonium in 136 days. Radium can be considered as being constant (half value period 1,580 years). Thorium X and polonium have been used in injections, but these substances cannot be obtained very readily or in quantities sufficient for medical purposes.

Injections of radium solutions have been tried in many hospitals abroad and in this country with good results. Soluble radium salts (bromide or chloride) of highest purity (without any barium) are used for this purpose. They are dissolved in distilled water and some sodium chloride is added to obtain a solution of the same osmotic pressure as the blood. Ordinarily 2 cc. of this solution are injected by means of a hypodermic needle. The quantity of radium in one injection varies from 5 to 100 micrograms.

Several authors[3] have shown that injected amounts of radium are retained within the system for a considerable time, at least partially for two weeks. This prolonged exposure certainly enhances the efficiency of even very small doses within the blood system. Elimination is so slow that the whole injected amount can act fully for a time sufficiently long to influence the living cells.

From the standpoint of the physicist, the injection of radium in solution is preferable to all other possible methods of internal administration of radioactive substances. It seems to be the most economic use of radium. It is brought directly in contact with the blood and α-radiation can act upon the blood corpuscles. Losses that take place in inhalations of radium emanation, drinking cures and other ways of administration, as per os, are avoided.

Summary

The physical qualities of α-, β- and γ-rays are discussed and it is shown that the ionizing power of the α-rays can be utilized medically best in intravenous injections of pure radium solutions. In all other possible ways of internal administration of radioactive substances, a lesser percentage of the given doses is utilized. It is shown that α-rays can act upon living cells of the human body only when the radiating substance is mixed with the blood or lymph.

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Ultra Violet Radiation*

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ULTRAVIOLET travels in straight lines so long as it remains in a uniform medium. (In the case of fused quartz rods bent in various curved shapes, the ultraviolet follows mostly the path of the rod because of the difference in the angles of refraction of quartz and air.)

The term *ray* is applied to the rectilinear path along which ultraviolet travels, in any direction, from a point in the generating tube. Since the tube emits ultraviolet in all directions, then any straight line from the tube constitutes a ray.

A collection of rays, proceeding from or toward a point, is termed a pencil.[1]

When the ultraviolet rays proceed from a point, the pencil is termed divergent; when toward a point, convergent. Thus, the ultraviolet pencils emitted by the air cooled and water cooled lamps are divergent; but when rock crystal lenses are used in the optical path of these pencils, they may be made convergent.

Coblentz, Long and Kahler studied the variation of irradiation parallel with the axis of the quartz tube. They used an R.U.V.[2] tube, which is in every way similar to the "Uviarc" tube of the modern ultraviolet equipment, and they measured the radiation intensity at what was judged by them to be the optical center of the tube, and at intervals of five centimeters to the right and to the left of this point. A specially constructed thermopile was used for the measurements, which they reported in terms of galvanometer deflection, as per the accompanying diagram (Fig. 1). These observers remark "that for a length of about 10 centimeters, which constitutes the light giving portion of the lamp, the intensity is fairly uniform."

Intensity of Radiation

By the intensity of radiation is meant the amount of ultraviolet received by unit surface. It depends upon:

(1) the distance of the tube;

(2) inclination of the exposed surface to the direction of the rays.

For ordinary light, as for x-ray, the intensity diminishes as we recede from the source. If the luminous source be a point, the intensity diminishes as the square of the distance increases. Using the digit "1" to signify the quantity of light falling upon a given surface at a distance of a foot or yard, the quantity falling on it at a distance of 2 feet or 2 yards is ¼, at a distance of 3 feet or 3 yards it is 1/9, at a distance of 10 feet or 10 yards it would be 1/100, and so on. This is the meaning of the law of inverse squares as it applies to light and x-rays.

What holds true for x-rays and some visible light rays, holds true also for ultraviolet rays in a perfect vacuum. That is, in vacuum, ultraviolet intensity obeys the inverse square law. But owing to peculiarities in the absorption of this energy by the various constituents of the air, the law of inverse squares cannot always be used with entire accuracy in the usual clinical application of ultraviolet. It is, therefore, imperative, that there be studied and understood the changes incident to ultraviolet in its passage through various media. Says Lyman, in his *Spectroscopy of the Extreme Ultraviolet*, in the section devoted to the absorption by gases: "The air was the first gas whose absorption was investigated by Schumann. It will be well, therefore, to begin with a general account of its behavior in the region of extremely short wave lengths before turning to the absorption of other gases.

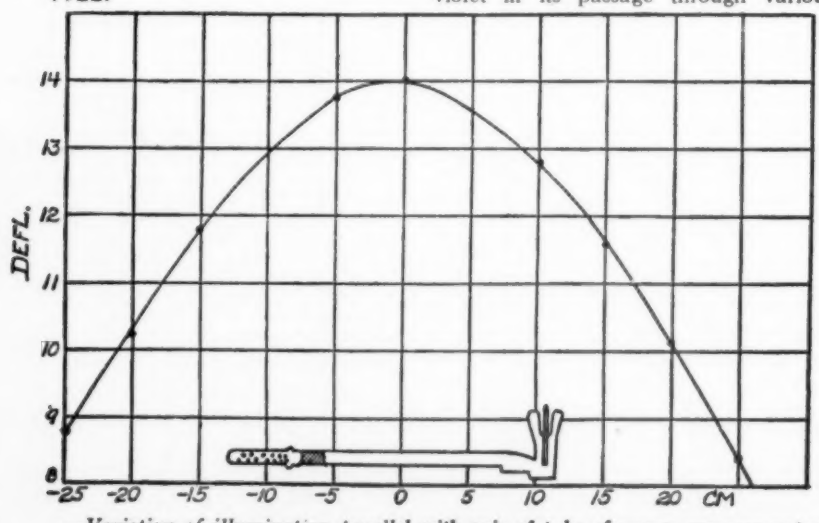
"Kreusler[3] found that a column of dry air 20.45 cm. long, free from carbon dioxide, absorbed 8.8 per cent of the light at wave length 1860. At wave length 1930 the absorption was so small that it could not be measured.

Schumann[4] examined the effect of change of thickness of the absorbing column; he employed the device which has already been described whereby the length of the absorption layer could be varied continuously. He used as source a discharge tube giving the spectrum of carbon dioxide. He found that the limit of the spectrum remained in the neighborhood of wave length 1780 while the path was reduced from 15 mm. to 8 mm. It was only when a length of 4 mm. was reached that the spectrum began to extend. From this point onwards the extension was much more rapid; with an air thickness of 0.5 mm. the last visible wave length was in the neighborhood of 1630. He carried his observations to air strata as thin as .05 mm. and showed that under these circumstances the spectrum stretched considerably beyond 1600. As the dispersion of fluorite had not been experimentally determined at this time, Schumann's wave lengths were obtained by a process of extrapolation, a method which yielded only approximate results to the neighborhood of 1600 and which completely broke down on the more refrangible side of this region. However, measurements on the absorption of air carried on at Harvard University[5] by a method in which the limiting wave lengths could be accurately determined, have served to confirm Schumann's observations to a marked degree.

"It is important to note in this connection how short must be the stratum of air in order that the region in the neighborhood of 1600 may be transmitted. Before considering the behavior of the air at the more refrangible limit of the Schumann region it will be most convenient to take up the absorption of some of its constituents.

"*Nitrogen* — Kreusler[3] found that nitrogen absorbed 2.2 per cent at wave length 1860; the presence of small

*—Received for Publication July 12, 1922.



—Variation of illumination parallel with axis of tube of quartz mercury vapor lamp; also illustration of lamp

quantities of nitrous oxide (NO) increased the value very considerably. Schumann[4] states that 'nitrogen proves itself very transparent, even beyond 1620, yet it absorbed particular wave lengths very energetically.' Experiments with the grating vacuum spectroscope[5] and a vessel 9.14 mm. long (see p. 48) showed that at atmospheric pressure nitrogen produces a very slight absorption extending continuously from 1800 or thereabouts to 1250. The strength of this absorption increases regularly with decrease in wave length, but even at the most refrangible end of the spectrum it is very small indeed. The energetic, selective action mentioned by Schumann was not observed.

"*Oxygen*—This gas is the dominating factor in determining the transparency of the air. Kreusler[3] ascribes an absorption of 32.5 per cent at 1860, 6.2 per cent at 1930, and a negligible absorption at 2000; the column was as usual 20.45 cm. long. Schuman makes the following statement: "Oxygen absorbs the rays in the neighborhood of 1850 in a series of clearly resolved groups of lines fourteen in number. These groups, which are of band-like form, constantly approach nearer one another with the deviation and are shaded off toward the red. Complete absorption is found with the most refrangible of them. It is this which makes the air opaque for all rays beyond 1850."

"*Carbon Dioxide*—Kreusler[3] attributes 13.6 per cent absorption to this gas at 1860. Schumann[6] states that the absorption spectrum is similar to that of oxygen with an indication of a 'rhythmical series in the shape of inverted groups of lines, but the end of this series is considerably more refrangible than that of oxygen. Accordingly, total absorption begins at a shorter wave length.' The observations made with the vacuum grating spectroscope are in very fair agreement with the statement made by Schumann, except that the rhythmical series were not observed near 1850. There were also some indications that maxima and minima of absorption do occur considerably on the more refrangible side of this position.

"*Water Vapour*—Data on this substance in the extreme ultraviolet are lacking. Schumann did not succeed in obtaining any information. Experiments with the grating apparatus indicated a maximum of absorption between 1700 and 1600, with some promise of transparency on both sides of this region, but the results are rather doubtful. The formation of opaque films of water on the windows of the absorption cell is the factor which causes the uncertainty."

From the studies presented it is observed that ultraviolet energy is materially absorbed for the wave lengths more refrangible than 2000 units; and that the longer wave lengths, such as are designated biologic in connection with the air cooled lamp suffer slight or no impairment. We may properly generalize the situation by saying that the law of inverse squares applies with clinical exactness in biologic therapy; but not so in bactericidal therapy. That is, in the use of the longer wave lengths of the air cooled lamp, the inverse square law obtains; whereas, in the use of the extreme short wave lengths of the water cooled lamp, the effect is lost if the distance of application exceeds the limit of air absorption, so that the law of inverse squares cannot here be utilized.

Cosine Law

Lambert's cosine law applies pertinently to ultraviolet radiation, for which it may be said that "The intensity received by a surface varies as the cosine of the angle of incidence." (The basis of this law, like that for the inverse square law, is purely geometrical and need not be reproduced here.) When the ray of ultraviolet strikes the radiated surface exactly tangential, the intensity is maximum; when the incident ray is nearly parallel with the surface irradiated, the angle approaching 0 degrees, the intensity is minimum, according to the following table which shows the approximate percentage of ultraviolet intensity according to angle of incidence of central ray (original intensity assumed 100 per cent):

Table I.

Angle of Incidence	Intensity
90°	100.00
85	99.6
80	98.7
75	96.6
70	93.9
65	90.6
60	86.6
55	81.9
50	76.6
45	70.7
40	64.2
35	57.3
30	50.0
25	42.2
20	34.2
15	25.8
10	17.3
5	8.7
1	1.7

In order to receive the maximum intensity of ultraviolet irradiation, the plane of the surface exposed should be as nearly at right angles to the central ray as the natural configuration of the part will permit.

Combining the inverse square law with the Lambert cosine law, as they apply to long ultraviolet wave lengths (biologic or air cooled), we find that

The intensity of biologic ultraviolet irradiation is proportional to the specific intensity of the source, inversely proportional to the square of the distance, and proportional to the cosine of the angle which the central ray makes with the plane of the exposed surface. This may be expressed in a formula as follows:

$$E = \frac{I \cos a}{d^2}$$

where E = energy falling on a surface;
I = intensity of ultraviolet as determined by wattage;
Cos a = Cosine of angle made by central ray and normal to surface irradiated; and,
d^2 = square of distance separating tube from surface rayed.

Abroad, the custom prevails to speak of the term E in Hefner units, borrowed from usual photometry. There may be an objection against the usage of a term conveying a meaning of illumination or candle power in connection with an energy that is invisible; and since the actinotherapist should ever remember that the rays responsible for most of the clinical effects are not seen, it is fitting that a unit be adopted to replace the meaningless (as applied to ultraviolet) Hefner-Kerze.

Mutual Independence of Rays

From geometry we find an expression of ray action which says that "the rays in a pencil of ultraviolet energy are mutually independent, or, the effect of a pencil of rays is simply that due to their sum."

This law is important as an index to the necessity for selective ultraviolet filtration; a means that needs yet to be developed for clinical adaptation.

The ultraviolet rays present in mercury arc spectrum are many and originate from band sources. Most important are the wave lengths as follows (taken from the frequency spectrum previously rendered[7]):

Wave Lengths of Important Ultraviolet Bands—

4000	2925
3907	2894
3821	2804
3752	2753
3663	2700
3650	2654
3544	2576
3391	2536
3342	2482
3126	2446
3022	2412
2967	2378
	2225

A study of the frequency spectrum shows these various bands to present vastly different intensity values; and it would seem that the feeble intensity of some, as compared to the strong intensity of others, would preclude the usefulness of certain bands for therapeutic application. But this important law seems definitely proved: *The biologic effect of the different rays is not proportional to the energy in these rays, though, of course, the effect of ultraviolet is dependent upon the amplitude of the wave, its intensity and its length*[8]. To illustrate, observe the frequency spectrum and compare the energy intensity of two bands, say 3650 (group) and 2536. The first group is more intense than the second; yet the second is many times more bactericidal than the first. In other words, the quality of bacterial destruction is a function of the amplitude, intensity and length of ultraviolet characterized by 2536, as against 3650; though the actual bactericidal capacity of the 2536 band is a function of its own intensity. That is, when the intensity of the mercury vapor arc is increased by furnishing a greater energizing wattage, the specific activity of each band is proportionally increased; but the chemical work accomplished by any individual band group has no obvious relation to the energy represented by each band. It is for this reason that the watt has not and should not become the unit of ultraviolet treatment. The watt expresses intensity of the energy; but we are interested in knowing the biologic efficacy of each individual band. With this determined it is an easy matter to increase the effect by augmenting the intensity (wattage) or lengthening the treatment time.

Distribution of Actinic Effects in the Spectrum

In keeping with the theme just propounded, Mast, in his book, *Light and the Behaviour of Organisms*, devotes an excellent study to the topic, as follows: "That light causes profound changes in chemical compounds is a matter of common information to all familiar with the process of photography. The fact that the shorter waves of the spectrum, the ultraviolet, violet and blue are chiefly active in causing changes in the halogen salts of silver and various other metals used in this process, is at least in part responsible for the idea that photochemical changes in general are largely if not entirely brought about by the action of the shorter waves, which are usually referred to as the actinic rays.

Photochemical reactions are far more numerous in both the inorganic and the organic realms than is generally supposed. Davenport brought together many instances under the following heads: synthetic, analytic, substitutional, isomeric, polymerismic, fermentative effects of light. Recent investigations have made known others which are of especial interest to us. Most important among these are numerous reversible reactions, reactions which take place in one direction in daylight or in light of a given wave length, and in the opposite direction in darkness or in light of a different wave length.

"The following reversible equations (Table II) are referred to in a recent paper by Stobbe (1908) on photochemical reactions. The first five are quoted by Stobbe, the rest were discovered by him. In these equations the arrows indicate the direction in which the reaction takes place in the different conditions of light with which they are labeled. In the first equation, for example, the reaction proceeds toward the right and toward the left in darkness.

Table II

1. $2\ AgCl \underset{dark}{\overset{light}{\rightleftharpoons}} Ag_2Cl - Cl.$

2. $2\ C_{14}H_{10}O \underset{dark}{\overset{light}{\rightleftharpoons}} C_{28}H_{20}O.$

3. $5\ AgI \underset{Dark}{\overset{light}{\rightleftharpoons}} AgI_3 - 2\ Ag_2I.$

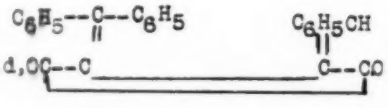
4. Tetraphenyldihydrotriazin.

   White $\underset{dark}{\overset{light}{\rightleftharpoons}}$ rose red.

5. Dimethyloxalesseigesterphenylhydrazon.

   White $\underset{dark}{\overset{light}{\rightleftharpoons}}$ citron yellow

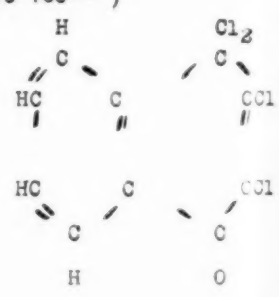
6. Triphenylfulgid,



   Orange yellow $\underset{dark}{\overset{light}{\rightleftharpoons}}$ light brown.

   Orange yellow $\underset{red\ or\ yellow\ (550\ to\ 700^{uu})}{\overset{blue\ or\ violet\ (440\ to\ 550^{uu})}{\rightleftharpoons}}$ dark brown.

7. B-Tetrachlor-a-ketonaphtalion,



   White $\underset{yellow\ green}{\overset{ultra\text{-}violet}{\rightleftharpoons}}$ violet.

"In the last two equations it is clearly shown that the longer waves as well as the shorter are actinic. Stobbe investigated the reactions of numerous so-called fulgides in the different rays of the spectrum ("Steinheilschen Spectrographen") and found seventeen which behave much like triphenylfulgid. There is however considerable variation as to the specific effect of the rays in the different forms. In general the shorter waves cause the fulgides to become darker in color, while the longer ones cause them to become lighter. But in some it is the violet which produces the dark shades, while in others it is the ultraviolet or the blue. "Je mehr sich die Farbe eines Fulgides vertieft, je weiter sich die Absorption eines Fulgides nach dem rothen Ende des Spectrums erstreckt, um so weiter ruckt auch die Erregungszone nach derselben Richtung vor" (1908, p. 31).

"In white light the fulgides turn dark, just as in monochromatic light, but strange as it may appear the reaction is much less pronounced, even if the white light has more of the effective rays than the monochromatic light of any given region in the spectrum. The relatively feeble effect of white light must be due to the presence of the longer waves, which, as represented in the equation

above, tend to produce the lighter shades and consequently retard the production of the darker. It may be well to call attention to the fact in passing that the investigations of Lubbock on Daphnia, of Wilson on Hydra and of Weisner on some of the higher plants show that as in the fulgides, monochromatic light consisting of certain rays is more effective in causing reactions than the same light in combination with other rays.

"It is evident from the last two equations that the longer rays as well as the shorter may have a specific photochemical effect. Triphenylfulgid, e.g., is changed from dark brown to orange yellow by the longer waves and not by the shorter. There are many other reactions which are induced only by the longer waves. Among the most important of these the process of photosynthesis in plants furnishes an excellent example. The maximum for this process lies in the red very near the Fraunhofer line C. This is not solely due to the fact that the rays in this region are more readily absorbed than those in the adjoining regions, for the violet rays are also absorbed, and here there is no appreciable effect on photosynthesis. In solutions which contain ferrocyanide or certain other coloring matter the longer waves are also more effective than the shorter, and pure ozone, which is changed to oxygen only in the ultraviolet, is similarly acted upon by the visible rays if chlorine be added. These various examples inevitably lead to the conclusion that while the shorter rays may induce chemical changes in more substances than the longer, they cannot be considered as the only actinic rays. The relative efficiency of the different rays depends first of all upon one or more of the compounds between which the photochemical reaction is taking place, but it also, at least in certain cases, depends upon the presence of substance in which no apparent change is taking place.

"Many of the photochemical reactions are exothermal. For example, the light conditions which induce the fulgides to become dark are much more effective in lower temperature than in higher. According to Stobbe it requires nearly ten times as much light energy to produce a given change at 100° as it does to produce the same change at 87°. A decrease in heat energy, therefore, produces the same effect as an increase in light energy, a statement which at first thought appears self-contradictory. As a matter of fact, however, it merely demonstrates the independence of these two forms of energy in producing chemical reactions.

"It is evident from what has thus far been presented that the actinic distribution in the spectrum is not proportional to distribution of energy. There are many well-known photochemical reactions which occur only in ultraviolet, the region of the spectrum which contains least energy.

"Precisely how light produces chemical changes is unknown, but it is clear that only those rays which are absorbed can be effective. The efficiency is however not proportional to the absorption. According to the excellent researches of Luther and Forbes (1909), the reaction between quinine and chromic acid is only affected by the rays absorbed by the chromic acid. Only about four per cent of the light absorbed by the quinine is changed to chemical energy. The ultraviolet and violet are most readily absorbed, but the green is most efficient, i.e., a greater amount of chemical action is caused by a given amount of light energy absorbed in the green than by the same amount absorbed in the violet and ultraviolet, showing clearly that the efficiency is not proportional to the absorption. The same is true in case of photosynthesis, which is supposed to be due to the action of light absorbed by the chlorophyll. Chlorophyll dissolved in alcohol has, according to Reinke (1884), a prominent absorption band in the red, a weak band in the orange, the yellow and the green, while from 500$^{\mu\mu}$ on, i.e., in the blue and violet, practically all light is absorbed. The maximum rate of photosynthesis however, takes place in the red, from which it decreases rapidly in either direction, so that beyond the green in the region of maximum absorption there is scarcely any photosynthesis."

Bunsen-Roscoe Law

The effect produced by each ultraviolet band, or by each group of ultraviolet bands (region, such as near or far ultraviolet) is in part expressed by the law of Bunsen and Roscoe, as follows: The effect is proportional to the product of the intensity multiplied by the duration of irradiation: or, in symbols:

$$E = K\ i\ t$$

where E=effect of energy
K=constant proportionality factor for the particular reaction under consideration,
i=intensity (wattage)
t=time, in seconds.

Which means that at a given distance, the photochemical effect derived is dependent upon the time of exposure duration (when the intensity is constant). But while this is true of isolated chemical reactions, it is not true of gross biologic results. For instance, at a distance and intensity where the exposure of a skin surface leads to a stimulative erythema, doubling the exposure time does not mean that there will accrue twice the amount of stimulation; it is usually the case that a blistering or desquamative erythema will result instead.

Where the effect of the irradiation is displayed on a constantly changing surface, as the capillary blood and lymph streams during a systemic exposure, then the law of Bunsen and Roscoe holds with greater accuracy. In this case, the reddening of the skin is not essentially the reaction sought; but, rather, the chemical changes that take place in the fluids.

Actinometry

Actinometry has been used as a general term for the measurement of radiation, more especially solar radiation; but it is fittingly restricted to the measure of the intensity of radiation by chemical means. Very obviously, there can be no absolute value in the significance of the term; for, as ultraviolet radiation of every wave length is capable of affecting some *one* particular chemical reaction, and the ultraviolet spectrum issuing from the therapeutic lamps is quite extensive, any actinometric measure would be only an index of the chemical activity of one group of wave lengths. So that any actinometer is of value only for a particular outfit, and then its use is greatly limited because it fails to register the patient's susceptibility. So that the calomel actinometer of Eder, and the various photographic sensitive papers and pastels introduced from time to time, have met with very little support from the clinic because of their extremely diminutive scope.

After all, actinometers depend for their accuracy on the "reciprocity law" of Bunsen-Roscoe; that a photochemical change will be in general greater the greater the intensity of ultraviolet. This has been found valid in the laboratory for isolated photochemical reactions; as for the chlorine-hydrogen actinometer, the ferric oxalate reaction, and certain silver salts. But the biologic reactions of the clinic are multiple and often antagonistic; which precludes the complete utilization of the "reciprocity law," as elsewhere discussed.

Variations in Methods of Ultraviolet Application.

Reviewing the changes produced by ultraviolet radiation in its passage from the equipment to the surface irradiated, we find that the effect can vary according to

(1) Initial energy intensity (wattage);
(2) Distance of the tube (inverse square law);
(3) Inclination of the exposed surface to the direction of the

central ray (Lambert's Cosine Law);
(4) Dominant wave lengths of the source (long air cooled, short water cooled);
(5) Time of the exposure;
(6) Reaction sought.

It is manifestly difficult to combine all of these variable factors into a single clinical unit; and it is unnecessary that they should be so combined. The therapist need only realize certain fundamental premises, as above outlined, from which there may be deduced a tangible working basis, as follows:

For the air cooled lamp, representing essentially the longer ultraviolet wave lengths unimpaired by passage through air:

(a) Superficial biophysical action;
(b) Deeper biophysical action.

Superficial biophysical activity is confined to the skin layers. It is desired here to produce the quickest result in the shortest interval of time, for which there may be used:

(a) High voltage (wattage intensity;
(b) Short tube—lesion distance;
(c) Short time exposure.

A good working formula would be:

Volts, 90;

Distance, 10 inches;

Time, from 30 seconds to 1½ minutes, depending upon degree of reaction sought.

This insures the expenditure of the energy on the skin surface, minimizes the amount absorbed by the lymph and blood streams, and, consequently, practically eliminates "systemic" effects. It is the basis for air cooled technique in which the dermatologist would be especially interested.

By deeper biophysical action is meant the change that develops as the result of irradiating a surface for a longer time with the view of affecting particularly the blood and lymph (and cellular chemistry). For this, it is best to recommend:

(a) Low voltage intensity;
(b) Long tube-lesion distance;
(c)) Long time exposure.

A formula, say, such as

Volts, 70;

Distance, 40 inches;

Time, from 3 minutes to 10 minutes. Here the skin reaction is minimized (owing to longer distance and less intensity), so that the fluids of the area receive the greatest amount of irradiation before discomfiture can accrue from the epidermal changes.

Each subsequent exposure, owing to the tolerance that develops as the result of pigment changes invoked in the skin, may be increased. Abroad, the custom has been to diminish the distance and thereby attempt to profit by the inverse square law. Shortening the distance, as we have seen, tends to bring shorter wave lengths into play;[9] so that instead of increasing alone the intensity of the radiation, there is a change in the spectral formula reaching the skin. It is better, therefore, to keep the distance fixed, and to increase the exposure time only. This augments the effect without changing the spectral value.

For the water cooled lamp, in which we are interested especially in the shorter wave lengths much impaired by air absorption, the technique must involve the closest practical range, which may be:

(a) Contact;

(b) Approximate.

By "contact," is implied an established continuity between the lens of the casing and the focal lesion to be treated. Continuity may be obtained by direct application, or by the interposition of various applicators, such as tubes, quartz lenses, quartz rods, etc. By "approximate" is meant any distance less than 15 centimeters between the lense and the surface to be treated. It is the method used for the "systemic" application of the water cooled lamp, the casing being gently swept over the entire nude front and back of the patient, in a fashion to insure complete irradiation. It is imperative to observe that "systemic" irradiation with the water cooled lamp is indicated for those biochemical reactions in which the short wave lengths are essentially useful. Short wave lengths can reverse the direction of chemical reactions that operate under long (air cooled) wave lengths of ultraviolet. And since the law of inverse squares does not obtain in the case of short wave lengths, unless the tube-skin distance is less than 15 centimeters (about 5½ inches), the effect produced will not be different from that gained by the air cooled lamp. Systemic irradiation with the water cooled outfit, if used for the special biochemical effect of the shortest wave lengths, must therefore, be at very close range.

A summary of the laws and their significance in establishing a therapeutic basis, is:

Law	Air cooled lamp	Water cooled lamp.
Inverse Square	Applies at long range	Does not apply at long range.
Cosine Law	Applies	Applies without applicators.
Bunsen-Roscoe Law	Applies in part only	Applies in part only.
Mutual independence of rays	Do not change distance in treatment. Simply increase time.	Keep contact for bactericidal effect. Not more than 5 inches distant for systemic irradiation.

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2. Both the R.U.V. and Uviarc tubes are produced by the Cooper Hewitt Company, Hoboken, N. J.

3. Ann. d. Phy. 6:418, 1901.

4. Smithsonian Contributions, 1413, page 29.

5. Lyman, Astrophysical Jour. 27: 89, 1908.

6. Smithsonian Contributions, 1413, page 16.

7. Jour. Radiol. 3:380, Sept. 1922.

8. This significant law should be carefully appreciated by reason of its great bearing in therapeutic accomplishment.

9. For the loss of radiation effect because of ray inclination see Table I.

The Roentgenological Aspects of the Visceral Crises*

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THE roentgenologist has not infrequently to report negative findings to the physician or surgeon who has diagnosticated gastric or duodenal ulcer or appendicitis, or renal calculus or gall stones. Negative findings are rarely valued by the patient and are reluctantly received by his medical or surgical advisors. Nevertheless the roentgenologist must spend unusual time, care and skill in arriving at these negative findings in the face of symptoms and a history which may seem convincing of other conclusions. An added difficulty lies in the fact that gall-stones in more than 50 per cent of cases give negative findings as does also chronic appendicitis excepting for the accurate localization of tenderness on palpation under screen inspection.

The disadvantages of the negative report may be minimized by a study of the less frequent causes of abdominal pain. These causes in general are known to you all but are usually disregarded, as lying within the province of the internist and as without roentgenological significance. Such are the visceral crises of the erythemas, of angioneurotic edema, of tabes dorsalis, of mucous colitis, and especially of abdominal angina. There are of course other causes of abdominal pain not the subject of this paper such as spondylitis, epigastric hernia, adhesions, obstruction, neoplasm, tuberculosis, pancreatitis, mesenteric thrombosis, etc., and negative findings may be made positive sometimes if we know how and when to look.

Although these various causes of abdominal pain are comparatively rare, even in the aggregate, yet any individual case may be of the highest importance. Furthermore the roentgenologist should be familiar with them as a matter of diagnostic culture just as he must know rare bone pathology such as multiple myeloma, Perthes' disease, osteogenesis imperfecta, osteomalacia, osteochrondritis dissecans or ostitis fibrosa.

In our series of 913 cases of abdominal pain we find 4 cases of the visceral crises of the erythema, 2 of the intra-abdominal type of angioneurotic edema, 1 of the gastric crisis of tabes, 13 of mucous colitis and 10 of abdominal angina.

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 6, 1922.

Visceral Crises of the Erythemas

These are usually described briefly and inadequately in textbooks and even in large works of reference under the head of Henoch's purpura. The most satisfactory description with case records which I could find was in three remarkable papers by William Osler in the American Journal of the Medical Sciences—one in 1895 and two in 1905, and in Lockwood's *Diseases of the Stomach*. Osler collected in his own practice 29 cases, all under 20 years of age. All had attacks of severe abdominal or lumbar pain lasting a few hours. Attacks recurred at irregular intervals of weeks, months or years. They were usually accompanied by vomiting of bloody material and were also characterized by a diarrhea with the passage of blood. When the colics were lumbar, the urine usually became bloody. Is it any wonder, therefore, that these cases would be confused with gastric ulcer, appendicitis, renal stone or some organic intestinal affection, and nowadays referred to the roentgenologist for demonstration?

Osler states (American Journal of the Medical Sciences, May, 1974, p. 751 and p. 754), "The possibility of mistaking these visceral crises for appendicitis or intussusception or obstruction of the bowel, and handing the patient over to the surgeon for operation, is by no means remote. In Case II of my series one attack was unilateral, and of such severity that the physician who was called in, knowing nothing of the previous history of the case, diagnosed renal colic. In Case XX the child was supposed to have appendicitis and was admitted to the surgical ward. Fortunately the skin rash was noticed, the pain subsided, and he was transferred to the medical wards. The association of the colic with the passage of blood per rectum may, of course, lead to the diagnosis of intussusception. * * * "The practical lessons to be drawn from these three cases in which laparotomy was performed are: First, that in children with colic the greatest care should be taken to get a full history, which may bring out the fact of previous attacks, either of skin lesions, of arthritis, or of intestinal crises; and secondly, to make the most careful inspection of the skin for angioneurotic edema, purpura, or erythema. It is also to be borne in mind that recurring colic may be for many years the sole feature of this remarkable disease. * * * The colic is the most constant of the visceral manifestations, occurring in twenty-five of the twenty-nine cases in my series. * * * The examination of the cases of Dr. Sutherland and Mr. Barrows confirms the view that the colic is due to infiltration of the intestinal wall with blood and serum."

I do not know of any report of roentgen findings in such cases. It is altogether probable that the peristaltic behavior of the gastro-intestinal tract may be altered in some characteristic manner. This is a small untouched field for future research.

Angioneurotic Edema

Osler considers that there is a close relation between the visceral manifestation of angioneurotic edema and the erythemas. The angioneurotic cases, however, are found at any age. In the Collected Papers of the Mayo Clinic, 1915, Crispin presents a most excellent summary under the title of *Visceral Crises in Angioneurotic Oedema* in which he quotes largely from the forementioned papers of Osler and adds much original matter from the abundant material of the Mayo Clinic. Crispin states: "A large number of the patients suffering from visceral crises, particularly of the erythemic, pupuric, angioneurotic group, are advised to have surgical operations, and many of them sooner or later submit to abdominal surgery, from which they do not obtain desired relief. * * * These visceral or gastro-intestinal crises may be so severe at first sight as to cause concern, and they may be without external clues in the nature of lesions of the skin. If the history is not carefully taken, the hurriedly called physician may easily be misled into thinking that the trouble must be due to the gall-bladder or appendix, or at least something that should be taken out. * * * There is another type probably resulting from the same primary cause that is occasionally mistaken for appendicitis or appendiceal abscess in which the onset and disappearance of pain are more gradual. A swelling often appears in the lower right abdomen, which suggests appendiceal abscess. * * * Three cases of induration of the cecum and adjacent gut have been observed in the operating room by W. J. Mayo. Before operation, because of the timefaction, these cases had suggested appendiceal abscess. The induration was found in the cecum and in the appendix without sufficient cause. These patients

got well with striking rapidity. A history of swelling of the skin was obtained afterward."

A further quotation from Crispin may be made because it gives the only record of roentgen findings in these cases that I am acquainted with: "Roentgenograms showed * * * a lesion of the stomach at or near the pylorus. After this examination of the stomach and while still in the dressing-room, the swellings were observed coming out. Within ten minutes thick, raised, hardened areas the size of half a dollar were noted on the thigh. Further examination revealed areas, nearly as large as the palm of the hand, over his back. Though the angioneurotic condition was recognized, because of the history of hematemesis and roentgen findings exploration was advised. At the operation nothing was found in the stomach. The gall-bladder was removed, but, when opened, revealed doubtful pathology. An obliterated appendix was also removed. One year later the symptoms were the same as before operation without noticeable change in any characteristics. The lesion at or near the pylorus reported by the roentgenologist was probably a visceral swelling. Seventeen months later the patient's physician reported attacks of abdominal pain and skin manifestations, the same as before. The last attack of pain was of the usual type, being in mid-epigastrium, severe, lasting from seven in the evening until half past one, during which time the patient was given one-half grain of morphine. * * * A diagnosis of visceral crises of angioneurotic type should not be made until careful examination has excluded or made independent surgical causes. In this, roentgenologic examination of the gastro-intestinal tract is valuable negative evidence."

Mucous Colitis

This may be accompanied by visceral crises of great severity, which have many times been mistaken for appendicitis or some other intra-abdominal condition. We have frequently seen a thin streak of barium persisting in the colon after evacuation in these cases and we believe that this appearance may give the roentgenologist a clue to the true cause of some of these cases of abdominal pain.

The Gastric Crises of Tabes

This, although much rarer than the foregoing group is by far the best known and only occasionally reaches the x-ray department. It is roentgenologically silent.

Abdominal Angina

This is much the most important and frequent of the group giving visceral crises below the diaphragm. While the crises of the erythema occur in the young those of angina are found in the latter half of life.

One of these patients may come in with a history suggestive of gastric or duodenal ulcer; another with a history indicative of gall stones, and yet another may give a history pointing towards appendicitis. But these patients will have no ulcer, no gall stones, no appendicitis. In due time they are likely to die in classical attacks of angina pectoris. But before this final tragedy they are more than likely to be referred to the roentgenologist for a demonstration of the ulcer, the gall stones or the abnormal appendix. In the face of a convincing history, the roentgenologist may strain his eyes into seeing some slight niche, some peristaltic anomaly, some deformity of the duodenal bulb, some faint ring shadow of a nebulous gall stone or some peculiarity of an unsuspecting appendix. If finally a roentgen report of negative findings is submitted, the surgeon is likely to view it as one more piece of evidence of the limitations of the x-ray. Thus the poor patient too often wends his way to the operating table because the x-ray found something that did not exist or because the surgeon was convinced that the x-ray had not found something that did exist.

A case of abdominal angina may simulate gall stone colics, even to the point of showing slight but definite jaundice. When angina is known to be present there may often be a doubt as to whether the patient may not also have gall stones. Likewise with known angina there may still linger a suspicion of concurrent gastric or duodenal ulcer or of appendicitis, according to the type of the angina. Considering that these cases are poor operative risks a true diagnosis is especially desirable.

The most characteristic form of the disease is dependent upon exercise. An attack may be induced after any meal by sufficient exertion, but if the patient is quiet no abdominal pain results. The attacks are independent of the character of the food. When the pain begins, rest is the chief requisite for complete relief, but it is a curious fact that the belching of gas may in some true cases be excessive and abruptly terminate an attack.

Although abdominal angina gives no x-ray signs below the diaphragm, it is possible in a proportion of cases to show a dilatation of the aorta, especially of the descending thoracic or a cardiac outline more or less characteristic of aortic valve disease. For enlargement of the heart, the Bardeen method is here of great service.

Out of the extensive literature we may select the account in Lockwood's *Diseases of the Stomach;* Vol. V, of Monographic Medicine; and the Mayo Clinic, Vol. II and Vol. X. The term abdominal angina is not always to be found and the subject may be discussed as the abdominal symptoms of angina pectoris. Lockwood states, "A patient may be suddenly seized by sharp lancinating or crushing paroxysmal pains which recur at short intervals after every fifteen or twenty minutes, and last but a few moments at a time. Slight icterus has been observed at times, suggesting the possibility of biliary colic. A succession of paroxysmal pains constitutes an attack which may last for several days and be followed by a period of comparative freedom. The attacks are often induced by worry or nervous excitement,, and may appear during the night. During the height of pain dyspnea, moderate cyanosis, and Cheyne-Stokes respiration may be present. In a few of the cases a moderate icterus has been observed." Another type of abdominal angina is noted by Lockwood as follows: "A dull aching and throbbing pain may be experienced about one hour after eating, which is not due to gas. As a rule the heartier the meal the greater the distress. It is probable that in these cases the narrowed arteries are able to carry sufficient blood to the stomach for its requirements in the quiescent state, but are unable to meet the increased demands of physiological congestion during the digesting state. During active peristalsis the symptoms of ischemia become apparent and the condition is therefore akin to that of intermittent claudication." Fussell in Monographic Medicine, Vol. V., page 430, states that angina pectoris is to be differentiated from indigestion, gastric ulcer, gall stones and appendicitis. He says further, "Cases of angina pectoris occur which have as their cardinal symptoms pain in the epigastrium after eating and on exertion, the exertion having to be stopped immediately. Relief of this pain accompanied by belching of large amounts of gas are frequently considered both by the laity and by physicians as indigestion."

Such cases, he repeats, "are due to real cardiac disease, and, while they are looked upon often as simple indigestion, they are really cases of angina, and may eventuate in cardiac decompensation or in sudden death." Again he says, Vol. V., page 321, "Angina pectoris is frequently accompanied by pain, having its chief point of severity in or about the gall-bladder region."

Eusterman, Mayo Clinic, Vol. II, page 1918, reports a case of abdominal angina which had been sent in for supposed gall stones. Eusterman's article on abdominal pain contains the only reference to abdominal

angina which I was able to find in th Mayo literature.

As you well know, digestive symptoms and epigastric pain may arise as a reflex from organic disease in the appendix, the gall-bladder or many other organs of the body. But without reflex disturbances of any kind, certain diseases which are roentgenologically silent below the diaphragm may closely simulate organic diseases of the digestive system to the discomforture of the roentgenologist. A study of this group may avoid serious diagnostic errors, fruitless medical treatment and equally futile surgery, and may be of inestimable value to the patient by indicating a regimen for the relief of pain and the prolongation of life.

The roentgenological aspects of this group of diseases giving rise to visceral crises consist:

1. In the value of negative findings.
2. In the necessity of a careful review of the clinical records before drawing roentgenological conclusions.
3. In the value of certain slight inconstant positive roentgen signs.
4. In the necessity of examining the chest for signs of aortic or cardiac disease.

EDITORIAL

The JOURNAL OF RADIOLOGY

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Policy of the Radiological Society

THIS is an opportune time for the members of the Radiological Society to take an inventory of their aims and purposes. The Society has had such a phenomenal growth that the casual observer wonders what made it possible. This growth was not the result of chance, but was due to a definite well thought out plan put into action at the time of the reorganization of the small sectional Western Roentgen Society into the broad Radiological Society of North America. That the men responsible for the reorganization had an altruistic motive impelling them is attested by the popular approval of the organization. The same principles which make for success in a business enterprise govern the success of a scientific organization. Mr. John Siddal, the editor of the American Magazine puts this truth in the following words:

> "Ingrowing businesses usually die a painful death. Nature protects herself by a fiat that the self-centered man or the self-centered institution shall surely shrivel up and blow away. On the other hand, the man who thinks first of his customer nearly always succeeds.
>
> "You may think that this is obvious. All business men, you say, instinctively must think first of their customers. But they don't. Many of them are so self-centered that they fail to see the advantage to themselves of forgetting themselves, and looking at things from the point of view of those with whom they deal. The successful man is always smart enough to put himself in his customer's place. He wins out—and then the world calls him a genius."

So long as a similar motive impels the Radiological Society just so long will it succeed. Whenever this motive is lost then failure will surely follow.

Dr. Alden Williams, president of the Radiological Society, 1921, wisely established a far seeing policy. This policy aimed to accomplish the following:

1. To extend the membership to include as nearly as possible all men practicing radiology on the continent of North America.
2. To elevate the practice of radiology:
   (a) by giving the members a clearer understanding of this broad medical specialty.
   (b) by securing the cooperation of other medical organizations.
3. To provide permanent means for publication of the official organ of the Society, the Journal of Radiology.
4. To lay the foundation for a permanent endowment fund for research in radiology.
5. To provide a plan for licensing radiological technicians.

This policy provides work for future years. The officers of the Society, subsequent to 1921, are morally bound to proceed with this policy or be guilty of malfeasance in office.

It has been and still is the aim and purpose of the Journal of Radiology to continue this broad-minded policy and to bring about its realization as far as possible. Sustained activity well directed is the only solution. Editorials of the past year have contained much thought in support of the policy of Dr. Williams. His policy was much wiser than the casual observer might think. He united the College of Physicians, the College of Surgeons and the Radiological Society in cooperative effort to put the practice of radiology on a proper level. His policy, if carried through to its logical conclusion, will do more for the radiologists of the North American Continent than any movement previously inaugurated. Let us quote briefly from the speech of Dr. Franklin H. Martin of the College of Surgeons. This speech was made at the annual meeting of the Radiological Society, December, 1921, when Dr. Williams was president:

> "Do you realize that to that mechanical 'too goodness' you should add idealism? That, I know you have or this society in six years could not have grown into the society that it has. No society lives on pure mechanics. No society lives on pure science. It must have an ideal.
>
> "Your president has just given a hint that you have ideals and aspirations. He wonders why the American College of Surgeons in its minimum standard has not required that the roentgenologist in the hospital be a medical man. We did not think that would be necessary, but it is something we are very glad to have suggested, and it will be written in just as soon as public opinion will support it. This organization must realize that it is probably right on the brink of doing work the most important that the medical profession will have to do. You are probably right on the brink of therapeutic work that will mean the control and possibly the curb of malignant diseases. You not only will be the mechanism, the picture maker, the searcher after things, but you will be great therapeutists. *Let me urge this: That you do not remain any longer simply water carriers and wood choppers and assistants, but insist that the roentgenologist be a medical man and insist that he sit in at the consultation.*"

This address committed the College of Surgeons to the policy of Dr. Williams and the Radiological Society. As proof that this action has already borne fruit it is interesting to read the proceedings of the American College of Surgeons as reported at the Hospital Conference, Boston, October 23, 1922. This report is published in Surgery Gynecology and Obstetrics, January, 1923, pp. 149-150; it is headed, "Section D—Roentgenological Service" and is made by William A. LaField, M. D., Bridgeport, Connecticut. The report reads thus (italics our own):

> "It has been suggested that our discussion of this subject be limited largely to the extent and supervision of x-ray service in hospitals. Accordingly, our program contains the following questions to guide our discussion:

1. "Hospitals today are asking what should constitute a complete service in an x-ray department. Should all institutions be able to perform fluoroscopic examinations, gastro-intestinal work and treatment?
2. "In many hospitals today the x-ray department is under the management of trained technicians. It is generally stated that interpretation of x-ray plates can only be done successfully by the trained medical man. In such places as cited, interpretation has to be left to the individual physicians referring cases. Is this satisfactory, and can you have an efficient x-ray service in this manner?

"I have great reluctance in coming before you and attempting to give precise answers to some of your problems as to the x-ray laboratory in a small hospital. May I say first a word as to the responsibility of the roentgenologist. In the first place, *the responsibility for the service must be left to a competent roentgenologist who must be a graduate physician well versed in anatomy and physiology; he should be a competent physician*, so that he may study with you the essential data regarding his x-ray findings and give you an intelligent interpretation. He must have a fair working knowledge of radio-physics. He must be a good amateur photographer, something of an electrician, and something of a politician. The technician—the individual who does the routine work of the laboratory—should be a graduate nurse trained by a roentgenologist and should follow a definite routine technique in all roentgen examinations; and she must work under the supervision of an attending roentgenologist. She must confine her activities entirely to x-ray practice. She must work under such supervision that she will realize her limitations and responsbilities.

"With a hospital of perhaps 100 beds or in a community of 25,000 to 50,000, it is not usual to have a man give his entire thought and attention to the practice of roentgenology as a profession. A community as small as that will not adequately support a man doing roentgenology as a specialty. In any hospital measuring up to the standard of the American College of Surgeons there is no reason why this department could not be placed under the intelligent supervision of a roentgenologist who is not necessarily an active member of the hospital staff. He may be a man in a comparatively remote place from the hospital he serves. It seems to me the first plan would be to establish a small department under the immediate supervision of a graduate nurse who has been trained in this work.

"Perhaps we can best bring out the answer to the first question, 'What should constitute a complete service in an x-ray department?' by giving you first the limitation of your roentgen service. There is no doubt in the mind of every man doing extensive work in this line that every hospital should be equipped to do roentgenological examinations of the gastro-intestinal tract, chest, skull, and the urinary tract. Some hospitals leave the entire charge of roentgenology to a technician. Would you rely upon the opinion of an orderly or a nurse for an interpretation of the changes in the renal pelvis? Would you rely upon the opinion of a high school graduate, not a graduate physician, as to the significance of a tuberculous lesion in an extremity? In my mind there is no question as to who should assume the responsibility of x-ray interpretation.

"The interpretation of x-ray plates cannot be left to the various members of the hospital staff. *The relationship of the roentgenologist to the staff is the relation of the consultant to the physician.* If the roentgenological service is to be of any real value in your hospital you must look upon your roentgnologist as a consultant. If the roentgenologist is of the right type his opinion is just as valuable as the opinion of your attending neurologist. In our hospital we do not send a requisition for an x-ray examination; a consultation is arranged and the patient is referred to the x-ray department for consultation. If a medical roentgenologist is in charge of the x-ray department he should be equipped to do roentgen therapy. That is a procedure of such responsibility that it cannot be left to a technician, no matter how well trained.

"I am in a position to judge somewhat of the x-ray needs of a hospital in a small community, and I believe we have solved the problem for one hospital in our state near Bridgeport. A hospital of about 100 beds in a community of 25,000 has a competent graduate nurse in charge of the roentgenological service and the films that are taken there are sent to us for interpretation. A roentgenologist can in the course of two or three months train a graduate nurse in the roentgen examination of the gastro-intestinal tract so that she can produce a series of plates following out a standard technique. A movement has now been instituted by the American Roentgenological Society to standardize x-ray reports. A long time ago routine examinations were standardized as to technique, and the standardization of the report and the individual interpretation of it will mean adequate service for the small hospital.

"*I believe that technicians assuming the responsibility in hospital x-ray service should be examined as to their fitness for the work, be registered, kept within their limitations.*"

Could any language be more forcible? The College of Surgeons has now taken the stand that in all standardized hospitals, at least, the department of roentgenology shall be in charge of "a competent roentgenologist who must be a graduate physician well versed in anatomy and physiology." "He shall be a competent physician." Further, "The relationship of the roentgenologist to the staff is the relation of the consultant to the physician."

It will be recalled by those present at the annual meeting of the Radiological Society, December, 1921, that Dr. Frank Smithies, representing the College of Physicians, made a very pertinent statement, saying that the "American College of Physicians insists that the direction of all laboratories of actinology shall be in the hands of properly licensed, properly educated and practicing physicians." This statement of action already taken by the American College of Physicians is followed by a similar action by the American College of Surgeons, as shown above. These standards are now an accepted policy by the two most representative bodies of physicians in America. Is it any wonder that we point now to the wisdom of Dr. Alden Williams in outlining such a policy.

With so much accomplished in two years, the possibilities of the future are beyond visualization. In order that future growth may be equally satisfactory it is essential that those in authority in the Radiological Society have a clear cut idea of the policy of the Society and that they eliminate all self advancement and selfishness. As Dr. Wasson recently expressed it: "The very fact that a man seeks an office in the society should at once render him unfit for election." The constitution of the Radiological Society, as well as that of any other organization is the law by which that body lives. If the constitution is disregarded the organization is like a ship without her rudder—a wreck is near at hand. Along the same line of thought it might be well to say that when any officer already elected degrades his office by entering into personalities and wilfully making unfounded accusations against other members of the organization, and

even violates the constitution of the society, his resignation should be called for at once.

Dr. W. Warner Watkins in an able editorial in the February issue of the Journal called attention to the need of uniting all medical men interested in radiology. So thoroughly has the writer been convinced of this necessity that not only all possible personal influence has been used, but the fixed policy of the Journal of Radiology has been exerted toward that end.

It will be recalled that in 1920 when Dr. Tyler was called to the presidency of the Society there was a membership of about 200. During his term as president, under the able work of Dr. Alden Williams, then Chairman of the Membership Committee, approximately 200 additional members were added. During the presidency of Dr. Williams in 1921, approximately 200 more members were secured, and during the presidency of Dr. Albert Soiland, 1922, about 200 additional members were elected.

Inquiry into the Society records shows that during the years 1921 and 1922, the applications for membership were secured either because of the prestige of the Journal of Radiology or directly through the Journal organization, the Chairman of the Membership Committee being responsible only for the policy followed. These facts emphasize the value to the Society of an aggressive official organ, and emphasize also the fact that the Journal has at all times used its influence to promote the advancement of the science of radiology, and the Radiological Society.

Dr. Watkins also calls attention to the need of extending the membership so as to include as nearly as possible all radiologists in North America. He estimates the total number at 2,000. It is interesting to note that a survey already made by the Journal of Radiology discloses the fact that there are approximately 10,000 medical men on the North American continent who are eligible to membership in the Radiological Society.

With this information in hand, how dare any one say that the field is now covered and all that is now necessary is to fold our hands and enjoy the fruits of our labors? The history of every successful organization is indisputable evidence of the value of the young man to the society. To rest on past achievements is a sure sign of beginning decay. Dr. Watkins says: "We cannot and must not ignore these new radiologists, since they will be the leaders ten years hence." This means that if the Radiological Society is to remain virile the young men in the profession must make it so by being inside the membership and active in its work.

Numbers alone is not the ultimate goal, but there are vast unfathomed possibilities for advancing the membership of the Radiological Society without sacrificing quality by lowering standards. Once the young man is in the Society he becomes a bigger, broader man and in turn makes the Society bigger and broader.

If the individual on the inside can realize more fully that radiology requires a broad knowledge of medicine it will be that much easier to "bring the general profession to the realization that the interpretation of pathology, and not technical procedure, constitutes the work of the radiologist: that such interpretation requires a high degree of medical knowledge."

It is only necessary for the members and officers of the Radiological Society to continue to cherish the unselfish, altruistic motive as advocated by Dr. Williams and advanced by the Journal of Radiology in order to guarantee the steady growth of the organization. The plan of resting on our laurels, as suggested by some, is no less than suicidal. No matter whether the individual radiologist follows the lode star of altruism or degrades his profession and himself by sacrificing all to selfishness, the same rule holds good. Even the latter type of individual looking at the problem from a purely mercenary standpoint will be much better off if he aids his fellow specialists in every way possible. The work done by them will not curtail the selfish man's income, but on the contrary will bring more work to the community, of which he will get an increasing share.

Erratum, January Issue

IN THE article entitled "Weight Development in White rats as Influenced by X-ray Exposure" and written by Dr. S. Edward Sanderson of Detroit, we regret that the charts appearing therein have attached to them the wrong captions. The captions should have been as follows:

"Figure 1" and caption belongs with Figure 3 on page 14.
"Figure 2" and caption belongs with Figure 1 on page 13.
"Figure 3" and caption belongs with Figure 2 on page 13.

Regarding the caption appearing with Figure 4 the author submits this addition: "The two (rats) to the right were not treated to show weight development, but were accidental anomalies, born deformed. We know that the mother had a treatment three weeks before these animals were born. We do not know that this treatment had anything to do with the deformity of the offspring. We presume it is possible. The two animals to the left graphically illustrate the increase in body weight—so we deduce—secondary to x-ray stimulation, the smaller one above having received no treatment and being a normal rat, whereas the larger lower rat appeared to be the product of stimulative treatment. All animals had been preserved in 10 per cent formalin, which accounts for their disheveled appearance."

French Medical Radiologists

THE SOCIETE de Radiologie Medicale de France announces the following officers for the year 1923:

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DR. LEDOUX-LEBARD . . . . 22 Rue Clement-Marot, Paris

VICE-PRESIDENTS

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DR. CASTEX . . . . . 13 Rue Kleber, Rennes

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M. MASSON . . . . . 120 Boulevard Saint-Germain, Paris

German Congress

THE GERMAN Roentgen Ray Society announces its fourteenth annual meeting, which will be held in Muenchen, April 16, 17 and 18, 1923. Foreign guests are urged to attend, in the general invitation which the society has issued.

The first day will be given over to diagnostic problems, the second day to therapy and research problems, and the last day will be devoted to a discussion of the physics and the technique of x-rays.

Mid Annual Meeting

THE MID-ANNUAL meeting of the Radiological Society of North America will be held in San Francisco June 22 and 23. The hotel headquarters will be at the Palace, and the meeting will be held in the Civic Auditorium.

Recognition Rendered Roentgenology

THE Roentgen Society in cooperation with the Electrotherapeutics Section of the Royal Society of Medicine held a most successful meeting in Manchester this past autumn.

In an editorial in the *Lancet* of November 25th the writer remarks that two main lines of thought were stimulated in his mind by this meeting. One is of the rapid development and importance of radiology and radiotherapy in the medical world and the second thought is that radiology is developing along novel lines.

He says, "To the radiologist for a long time the fight for recognition has been somewhat of an uphill one. The presence of a number of physicians and surgeons at Manchester at a meeting presided over by Sir Humphrey Rolleston, as President both of the Royal College of Physicians and of the Roentgen Society, shows that general medicine and surgery are arriving at a thoroughly sympathetic attitude towards radiology. Similarly the well equipped demonstration room which is now provided on the initiative of Dr. A. E. Barclay at the Manchester Royal Infirmary, in which all clinical cases can be seen and demonstrated by the staff, should be a big step towards bringing about the needful cooperation. The pure pathologist too is turning with interest to the investigation of the changes which are produced in tissues by physical treatment, and work in the general investigation of cancer and other diseases continually suggests further points of view from which the radiologist can deal with disease."

Professor Salmonson

THe University of Amsterdam mourns the passing of Prof. J. K. A. Wertheim Salomonson whose death occurred the 16th of last September.

Since 1899 Professor Salomonson had held the position of Professor of Neurology and Radiology at that University and at the time of his death he held the office of Rector Magnificus there.

He was a master in medical and physical knowledge and had a genius for instrumental design, a combination of powers which makes his loss keenly felt in the radiological world at large as well as in the immediate professional and scientific environs of his efforts.

Professor Roentgen

WILHELM Konrad Roentgen, Ph.D., died February 10th, after a very brief illness. His body was cremated at Ostfriedhof Cemetery, Munich, Germany.

Professor Roentgen was born in Prussia in 1845 and in 1869 he received the degree of Ph.D. from the University of Zuerich, Switzerland. Following this he taught at Hohenheim, Strassburg, Giessen and Wuerzburg, where he was director of the physical laboratory.

After his discovery of the x-rays in 1895 he was, in the following year, awarded the Rumford Medal of the Royal Society, London. In 1900 Columbia University awarded him the Barnard Medal, and in 1901 he received the Nobel prize in physics. From 1899 he had been Professor of Experimental Physics at the University of Munich.

CASE REPORTS

Chronic Atrophic Arthritis

C. C. BIRKELO, M. D.
Detroit

CASE 3. We are reporting this case as it shows an unusual degree of atrophy and complete dislocation of several joints. There is also a small amount of hypertrophic change but the main condition is one of bone atrophy.

History: Mr. B., age 31, internal revenue collector, had three attacks of acute articular rheumatism in 1903, 1909 and 1914. During each of these attacks he spent several weeks in bed and at the time of the first attack, he was unable to be on his feet for three months. The rheumatic pains disappeared in all joints except the feet where it persisted until he had proper arch supports made and when these broke down he was unable to be on his feet for more than twenty minutes at a time. His history is otherwise negative and general health is good. No one has ever found any focus of infection as the possible cause of the arthritis disturbance.

No x-ray examination was ever made until the present one. He is now attending to his business and on his feet a considerable portion of the day with a fair degree of comfort.

Bilateral Calcification in the Fallopian Tubes

CASE 4. Mrs. M. G., age 34 married 15 years, has no children and no history of pregnancy. The menstrual history is normal. Family history is negative.

Past History: Patient has had measles and chicken pox but otherwise has always been well until three years ago when she began having dull aching pains over the lumbar region, extending forward to the region of the symphysis. These pains usually came on after prolonged exertion such as washing or similar work, and were often of the nature of colic. After these attacks small amounts of blood and pus would appear in the urine.

Tuberculosis of the right kidney was the clinical diagnosis, and an x-ray of the genito-urinary tract was requested. X-ray examination revealed two small round shadows in the pelvis, one 3 cm. to the left of the median line and the other 4 cm. to the right of the median line and both 7 cm. above the symphysis. These remained in the same position following catharsis and a diagnosis of calculi in the lower ureters on both sides was made.

An operation was then performed, a median incision being made. There were numerous pelvic adhesions and the fimbriated ends of both tubes were involved so that the lumen was closed in each. The calculi described in the x-ray were found, one in each fallopian tube, and removed. The right ureter was found to be about the size of an adult's middle finger, tortuous and tuberculous. The right kidney was not tuberculous.

It appears that all of the symptoms originated in the tuberculous right ureter and that the calculi found in the tube were not the cause of any pain.

*—Cases 1 and 2 reported in January Journal.

Bone Regeneration--A Graphic Story

L. J. CARTER, M. D.
Brandon, Manitoba

Fig. 1.

Fig. 2.

Fig. 3.

THE above illustrations exhibit in a graphic way nature's method of restoring a bone after bone grafting. The first shows a bone cyst of the second metacarpal. This was removed and nothing left except a small part of the base and the epiphysis at the head. A transplant from the tibia was inserted.

Four months later (Fig. 2) the transplant is seen apparently uniting with head and base.

Seven months after operation the transplant is taking the characteristic appearance of a normal metacarpal bone with the sites of union rounded off. (Fig 3.) Apparently the transplant has been adopted "holus bolus," and has not simply acted as a bridge and then undergone absorption.

Four and a half years after operation (Fig. 4) the medullary canal has become established, and it is difficult to distinguish the new bone from a normal metacarpal. Function is perfect.

Fig. 4.

DEPARTMENT of TECHNIQUE

An Aluminum Cassette For Use in Pfahler's Method of Examination of Sphenoid Sinuses

JOSEPH ASPRAY, M. D.
Spokane

I HAVE FOUND the vertical method of examination of the posterior ethmoids and anterior portion of the sphenoids very valuable. An aluminum casette to hold film and screens makes the method comparatively easy.

The casette is made of thin aluminum 3/8" by 2¾" by 5", the front end being rounded, and the other end is open. A piece of cardboard is made to fit this cassette and protrudes from the open end about an inch.

Before placing the cardboard in the cassette a flap of orange paper is fastened about three and one-half inches from the inside end. We have two intensifying screens, one of which is fastened to the cardboard and the other

to the flap. The duplitized film cut to fit, is placed between the screens and the entire filling is placed in the cassette with cardboard on the bottom. A lead letter "R" is fastened to aluminum top on right.

This cassette, properly loaded, is placed as far back as possible in the mouth, the patient breathing through the mouth. Out of over a hundred cases we have yet failed to see the patient who would not tolerate it.

Have patient lie upon the back on a four inch hard pillow, head straight, with a three inch cone centered so that the edge of the cone is near the head, and on a level with the anterior portion of forehead. The technique used is as follows: 90 degree angle, 4½ inch spark, 25 ma., 2½ to 3 seconds exposure.

Posterior-Anterior-Oblique Examination of Sphenoid Sinuses

For the past year and a half I have been using the following methods in the examination of the sphenoid sinuses, along with the usual lateral and vertical methods.

The patient is placed with forehead on cassette, in the position used when radiographing the frontals. The tube is angled upward ten degrees, a three inch cone is used and this is centered over the foramen magnum. Our technique with double screen is 4½ inch spark, 25 ma. and 5 seconds.

This will throw the sphenoid superimposed upon the frontals, and in the majority of cases shows the sphenoid sharply outlined. The size of each side and the densities can be definitely judged.

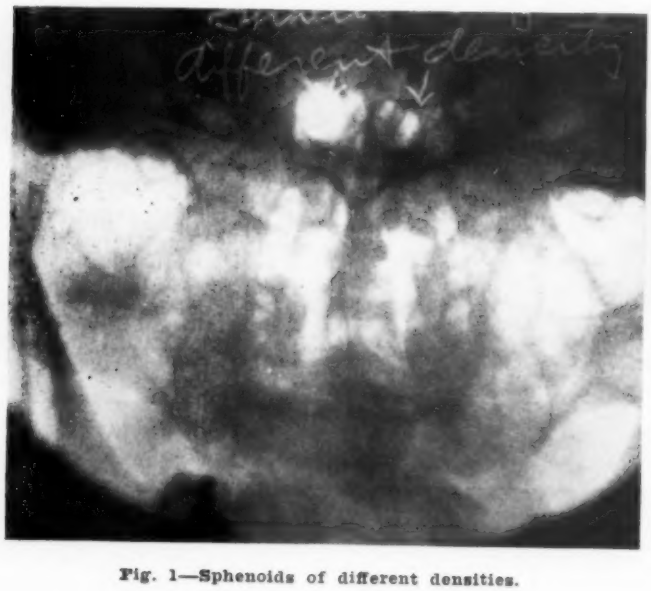

Fig. 1—Sphenoids of different densities.

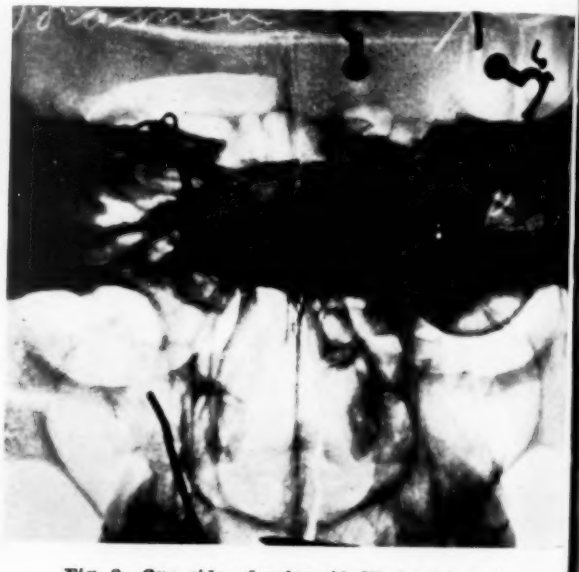

Fig. 2—One side of sphenoid filled with lead. Lead ring around foramen magnum.

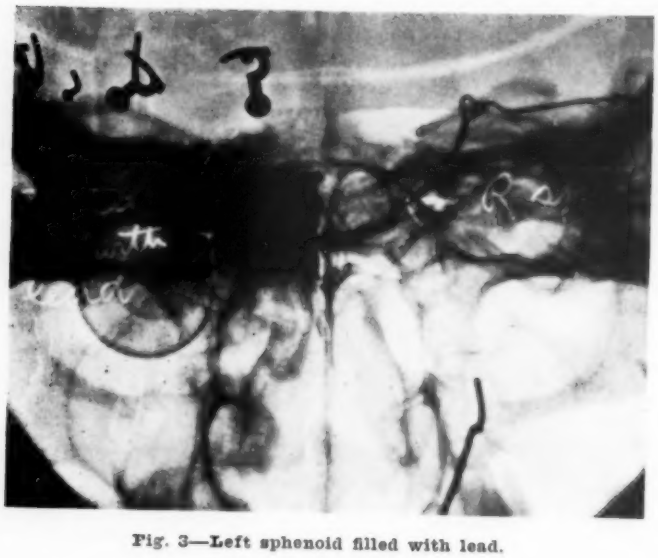

Fig. 3—Left sphenoid filled with lead.

Fig. 4—Right and left sphenoids.

(Note—Due to the fact that the illustrations in Dr. Aspray's article were transposed in the February issue, it is reprinted herein.—Editor.)

ABSTRACTS and REVIEWS

Foreign Bodies in the Bronchus and Esophagus. Chas. F. Bowen, M.D., Am. J. Roentgenol. 9:709, November, 1922.

PREPAREDNESS is one of the greatest factors for successful operation of these cases. Dr. Bowen describes how in one of his early and difficult cases he rehearsed the most minute details of the operation several times from beginning to end before the real event.

Many times foreign bodies are overlooked because the roentgen plate has not been sufficiently clear. Serious oversights have been known to thus occur. A lateral view should be taken if there is any difficulty about locating the body.

A foreign body in the esophagus can easily be removed by the forceps and fluoroscope if the body is smooth and not imbedded—otherwise the esophagoscope will be necessary and fluoroscopic guidance will aid the operation. The roentgen ray should be at hand ready for instant use for a body may change its location very quickly.

The bronchoscope is required for removal of bodies in the trachea or bronchi and it is just as necessary here that the roentgen ray should be ready to switch on at any instant..

Non-opaque foreign bodies are difficult to diagnose. In the lung an abscess or pneumonic process may furnish a clue, in the esophagus observance of a barium meal or capsule passing through may aid in locating the obstruction.

The New X-ray Department of the Manchester Royal Infirmary. Jour Roentgen Society, 19:22, January, 1923.

UNDER the leadership of Dr. Barclay the Manchester Royal Infirmary has a new x-ray department which is said to be the most completely equipped of its kind in Great Britain.

It is on the ground floor, indirect lighting is used and ventilation is splendid. Aluminum tubing replaces the old high tension wires and most of the x-ray bulbs are contained in boxes covered with lead sheet. The walls are coated with plaster containing a large admixture of barium sulphate which gives a protection equivalent to about 8 mm. of lead. Ceilings are white enameled.

Coolidge tubes and closed-core high tension transformers are used except in the treatment department where the existing induction coils have been brought up to date. The alternating current for the filaments of all the Coolidge tubes is furnished by a central rotary converter. Two separate 200,000 volt outfits each of the twin coil type are in use; one of these is of German make, the other an oil immersed type furnished by Newton and Wright.

Unusually elaborate screening stands and couches are installed. A very interesting feature is that the dark room can be flooded with light and air. Thermostatic control of the developing and fixing fluid is provided.

Other features of the plant are a demonstration room where doctors and students can watch examinations without hampering the work, and a "stereomotograph" which automatically changes lantern slides by pressure upon a button.

"The layout of the department is well nigh a model of its kind."

Radiation Therapy in the Modern Hospital. Henry Schmitz, M.D., F.A.C.S., Mod. Hos. 20:136, February, 1923.

THE writer announces that he is writing from the standpoint of a surgeon and a roentgenologist.

Localized malignant disease should be operated upon if "absolutely confined within the organ or tissue of primary occurrence" but "operations performed on advanced and generalized carcinoma only add to the unbearable misery of these unfortunate beings.*** Instead of relief a multiplicity of symptoms is added."

Cancers that have involved contiguous or distant tissues or organs should be treated by radiation therapy. Generalized carcinoma benefits neither by surgery nor radiation but should be treated symptomatically.

Hospitalization is necessary. The author recommends as preparation that the evacuation of the gastro-intestinal tract be made complete. The patient should be put upon liquid diet and should be given 30 grains of sodium bicarbonate the day before treatment, and each day during treatment and after care. Also the juice of three oranges should be given every four hours and water should be freely given. One half hour before treatment he gives the patient one-half grain of codeine sulphate. Vomiting and diarrhea, if excessive, should be treated by bed rest, large doses of bismuth subnitrate and sodium bicarbonate. Rectal flushings of starch water with tincture of opium are also recommended; if the patient can retain it castor oil is said to accomplish wonders in alleviating the discomfort. Bland foods, sunshine and tonics, especially iron and arsenic, are included in the after care advised.

Transformers of 280 kilovoltage whose output can be increased by connection with additional units in series are recommended in the equipment. Tables and tubestand should be of wood entirely and the patient should be properly protected. Lead wall linings should be three-sixteenths of an inch thick and the observation window should have at least three thicknesses of standard lead glass. Ventilators should be large. The problems of installation will differ in different hospitals.

The chief should in all events be a physician who has proper training and experience in the specialty of radiology.

There are various solutions of the problem of the financial relation of the hospital to the department. The physician may furnish all the equipment (including salaries of workers, repairs, etc.) and simply pay rent, or a percentage of net income to the hospital; the hospital, of course, will profit by the hospital services rendered patients. On the other hand the hospital may assume full responsibility and engage a director to work under hospital management.

The following budget is submitted, given an apparatus with an estimated life duration of five years, a tube with estimated life of 60 to 90 hours and a laboratory having a yearly capacity of 400 patients, actual running time six hours daily:

Sinking Fund	$2,000.00
Tube repairs	2,800.00
Salary (technician)	1,800.00
Incidentals	1,000.00
Total Expense	$7,600.00
Income	$20,000.00
Net profit	12,400.00

Acute Constitutional Symptoms Due to Radiation. Sir Humphrey Rolleston, M.D., Jour. Roentgen Society, 19:5, January, 1923.

THE hypotheses of roentgen ray intoxication are all reviewed in this paper together with a description of the symptoms of this condition. The ob-

servations and experiments of many workers are noted.

The author rather discredits the view that attributes most of the effects to contaminated atmosphere, though he considers that ventilation, careful technique, and dosage, state of the organism, blood count and pressure are all factors to be carefully considered in giving treatment if toxemia is to be held down to the minimum.

Diuresis assists in eliminating the toxic products and sodium bicarbonate both before and after treatment is considered a useful agent. Beck's method of surgical exposure and removal of as much of the growth as possible before radiation is mentioned as a possible aid in treatment.

To sum up the evidence, "It seems probable that the acute constitutional symptoms are due to flooding of the circulation with protein liberated by the destruction of cells."

Animal experimentation with injections of horse serum is now being done and may possibly bring at least a partial solution of this problem.

Protection in Radiology. George E. Pfahler, M.D., Am. I. Roentgenol. 9:803, December, 1922.

THIS article is an expansion of the preliminary report which was published in the October issue of the American Journel of Roentgenology and abstracted in the January, 1923, issue of this Journal, page 27.

The recommendations of the X-ray and Radium Protection Committee of England are given in full in the original article under the following headings: "X-rays for Diagnostic Purposes; X-rays for Superficial Therapy; X-rays for Deep Therapy; X-rays for Industrial and Research Purposes; Electrical Precautions in X-ray Departments; Ventilation of X-ray Departments; Radium Therapy."

General recommendations of this committee are as follows: "It is the duty of those in charge of x-ray and radium departments to ensure efficient protection and suitable working conditions for the personnel. The following precautions are recommended: (1) Not more than seven working hours a day. (2) Sundays and two half-days off duty each week, to be spent as much as possible out of doors. (3) An annual holiday of one month of two separate fortnights. (4) Sisters and nurses, employed as whole-time workers in x-ray and radium departments, should not be called upon for any other hospital service."

Dr. Pfahler recommends that the American Radium Society appoint a committee known as the Committee for Protection in Radiology, to cooperate with the Safety Committee of the American Roentgen Ray Society, together to formulate certain problems to be worked out by the Bureau of Standards at Washington, D. C.

He discusses briefly the protection of the patient, and the protection of the radiologist against loss and against unjust claims. The present loose system which allows men to practice radiology without proper preparation does much to bring the specialty into disrepute, for many legal claims arise from the mistakes of unqualified workers and the public does not discriminate. This state of affairs can and should be remedied.

Radiology: Its Use and Abuse. Reginald A. Morrell, M.R.C.S., Eng., L.R.C.P., London. The Lancet, 203:748, October 7, 1922.

THIS paper written for the senior medical students of Sheffield University leads to a high mountain top whence one may view the science of radiology in its relation to the rest of the medical world—but its dangers and pitfalls are portrayed along with its glories. It is all old news to the practicing radiologist but to the uninitiated student, who may not have attained an intelligent picture of the specialty, it is most enlightening; facts are presented in a telling manner, and furthermore it is written in such English as delights the ear and gratifies the mind appreciative of such things.

The Diagnosis and Treatment of Bone Lesions: A Brief Summary of the Salient Features. Joseph Colt Bloodgood, M.D., Am. J. Roentgenol. 10:42, January, 1923.

IN A CASE of known fracture x-ray examination is now a matter of routine but it has not yet become so in cases of contusion or bruise where the fracture is not at all apparent. Nevertheless it is in just these cases that it is, in the light of present knowledge, a very necessary procedure. Discovery of an incomplete fracture may thus be made, but far more important than this are the facts that preexisting osseous lesions are frequently thus revealed and that the x-ray picture of the bone at time of the injury is very valuable if later on there develops either a benign or malignant pathological process.

The author suggests several ways by which roentgenologists may improve their diagnostic acumen. One of these is by palpation, of which, in connection with roentgenologic diagnosis, the author says he is just beginning to learn the value. Also he believes that no diagnosis should be rendered by the roentgenologist until he has been made acquainted with all the clinical and laboratory findings in the case. To make a diagnosis from an x-ray plate alone is a great mistake. "In every patient with a lesion of bone there should be a Wassermann test, a complete blood examination, an examination of the urine for Bence-Jones bodies and a search for foci of infection in the tonsils, naso-pharynx, teeth and in the genito-urinary tract."

Complete records with a follow up system should be kept for their value to research if for nothing else, and all concerned can aid in this advancement of knowledge.

The Roentgen Ray in Diagnosis of Scoliosis. Frank W. Lamb, M.D., Am. J. Roentgenol. 9:723, November, 1922.

TRUE scoliosis and not the functional or habitual type which results from normal physiological posture is the subject of this paper.

True scoliosis is "a fixed deformity of the spine, characterized by a lateral bending of the column, with structural changes in the parts entering into it, together with a rotation of the bodies of the vertebrae on their vertical axes. The rotation of the bodies is always toward the convexity of the curve with the greatest amount of rotation at its apex."

The normal spine can assume the physiologic scoliotic position right or left, but in scoliosis, while the straight position may be more or less easily assumed, motion to the normal physiologic position opposed to the deformity is not possible.

The old positions and methods used for diagnosis of this condition are often misleading. "It is only by bending the spine laterally and twisting the vertebrae at the same time into opposed positions that the deformity of scoliosis can be determined. * * * In making an x-ray diagnosis of scoliosis the extreme right and left scoliotic positions must be used."

An easily constructed apparatus for holding the patient in position is described.

The Roentgen Diagnosis of Bone Tumors. H. M. Stewart, M.D., Pennsylvania J. Roentgenol. 4:11, October, 1922.

THE significance of the leading points (age, sex, location) which are used as guides in the diagnosis of bone tumors are sketched with particular reference given to characteristic x-ray findings in various tumors.

The author, citing Ewing as an authority, says that to designate bone tumors as round spindle or giant cell tumors in quite indefinite from the pathogist's standpoint, for all malignant

tumors may show these types at one time or another. Whether the tumor is malignant or not is the main point to be discovered and it is of advantage, if possible, to state the predominating cellular growth of the tumor.

Sarcoma (?) of Thigh, with Secondary Sarcoma (?) of Inguinal Region, Liver and Lungs. Recovery After Intensive Deep Roentgen Irradiation. J. Henry Schroeder, M.D., J.A.M.A. 80:23, January 6, 1923.

THIS article reports a case of sarcoma (?) of the thigh with secondary sarcoma of both lungs. Clinical diagnosis of sarcoma of the thigh had been made repeatedly in this case by competent surgeons and amputation had been advised.

Roentgen treatment consisted of ultra hard rays at 220,000 volts, and at 200,000 volts for the lungs, which received 70 per cent and the other areas 80 per cent of the surface erythema dose. From January 21 to February 1 the thigh, inguinal region and both lungs were irradiated, each region received the full dose in one sitting.

The author considers that this case proves that widely disseminated sarcoma is not a bar to successful treatment with roentgen ray irradiations.

Radiotherapy. J. D. Southard, M.D., Fort Smith, Arkansas. From reprint of a paper read before the Sebastian County Medical Society, Ark., October 10, 1922.

THE author of this paper particularly recommends x-ray therapy of bone tuberculosis and reports thirteen cases so treated and eleven cured (one year duration October, 1922).

Five of the cases involved the bones of the spine and one case each of the femur and hip joint, foot and ankle, hand, os ilii, humerus, knee and sternum. "In three of these cases, those of the foot, ilium and humerus, as shown by radiographs, there had resulted considerable bone destruction, causing large defects in the bones, all of which were completely repaired and the defects filled up by bone regeneration during treatment."

Decided success is also reported in the treatment of acne vulgaris.

General Principles of the Treatment of Skin Diseases. Roy Blosser, M.D., Rhode Island M. J. 5:352, December, 1922.

THE etiology of a dermatosis may be bacterial or metabolic in its nature or it may be due to food sensitization. Those dermatoses due to internal disorders, however, should be relieved by local treatment which can often be done, and at the same time the primary disorder be treated.

Roentgen ray is mentioned as useful in seborrhoeic warts, acne vulgaris, chronic eczema, eczematous ringworm and psoriasis.

X-rays in Diseases of the Skin. E. W. Reed, M.D., Brit. M. J. 2:559, Sept. 23, 1922.

TEXT BOOKS on dermatology do not as yet recommend x-ray treatment, except in stinted terms, but the value of x-ray in dermatoses deserves to be better known for often roentgenotherapy offers the best means of cure and succeeds when other measures fail.

The medical man knows too little of skin disease as a rule, but he should at least be able to distinguish the difference between an acute and a chronic inflammation. He should collaborate with a dermatologist when necessary.

The radiologist should also collaborate with the dermatologist but of course should regulate the dosage administered and should see to it that no metallic treatment is given at the time that roentgenotherapy is being used. Many serious complications can arise if this point is neglected.

Contra-indications to x-ray are grave blood diseases and those of blood vessel walls, acute inflammatory conditions of the skin and hemorrhagic skin troubles.

Remembering the contra-indications the rays will be found useful in cases of induration or thickening of the skin, itching, chronic infiltration, lichenification, in conditions requiring depilation and in new growths. All of these conditions are discussed in their clinical aspect.

Little is given of the technique but the author says that he uses a medium soft tube and states that he gradually increases filtration from 0.0 to 0.5 mm. Al to 2 mm. Al and back to 0.0.

The Roentgen Ray Treatment of Acne Vulgaris. Rudolph Jacoby, M.D., Boston M. & S. J. 187:793, November 30, 1922.

IN THE early history of x-ray therapy serious complications and sequalae followed x-ray treatment, but today in the hands of a careful operator who follows modern technique with modern apparatus x-ray treatment is perfectly safe and is the best method in many cases.

However, it is not necessary or wise to treat every case of acne vulgaris with x-ray for hygienic and medical measures are sufficient in many cases.

Three to four months are usually required for a roentgenographic cure providing the patient receives and follows proper advice and treatment and cooperates with the physician. The percentage of cures is about 90 and only about six per cent of this 90 per cent suffer a relapse.

"A standardized apparatus consisting of an interrupterless transformer, rheostat control, standard Coolidge tube, Coolidge transformer and control, and a milliameter must be used. The dosage is measured in skin units." Experimentation has proved that "a three inch spark gap and three milliamperes of current given for four minutes at an eight inch distance delivered the amount of ray corresponding to four Holzknecht units." These four units correspond to one skin unit which is a suberythema or epilating dose. Fractional doses of one-quarter skin unit (one Holzknect unit) are given weekly for from ten to sixteen treatments, even though all symptoms disappear after the first few treatments. Occasionally one will find a patient who cannot tolerate this dose, but not often. Caution and good judgment are requisite to give these treatments, as is true with any radiotherapeutic method.

Ultraviolet Energy in the Therapy of X-ray Dermatoses. A. J. Pacini, M.D., Am. J. Electroth. & Radiol. 11:363, November, 1922.

THE author's summary of his article is as follows: "Ultraviolet energy may be used as a preventive against the erythema produced under x-ray exposure. Ultraviolet energy through its cellular regenerative force, will assist in the reconstruction of indolent x-ray ulcers. In the treatment of acute and chronic x-ray and radium dermatitis the biotic qualities of the air cooled and the abiotic qualities of the water cooled equipment should be clearly and judiciously employed if best results are to be achieved. It is neither proved nor disproved that the application of ultraviolet energy, before or after x-ray exposure, will prevent the damage to cellular structures in depths greater than 75 or 100 microns. Aborting x-ray erythema through the use of ultraviolet energy must not be considered a corrective for the deeper tissue changes induced by the x-ray and radium trauma. Air cooled or biotic ultraviolet energy is useful in every form of acute x-ray dermatitis, and in raising tissue resistance in chronic x-ray dermatitis. Water cooled or abiotic ultraviolet energy, owing to its desquamative capacity, does much to relieve the prominent acanthosis that forms an inherent part of the chronic x-ray and radium skin changes."

The Bactericidal Action of Ultraviolet Light. S. Bayne-Jones, M.D., *and* J. S. Van der Linger, Ph.D., Bull.

Johns Hopkins Hosp. 36:11, January, 1923.

AUTHOR'S SUMMARY

"THIS paper describes methods by which exact determinations may be made of the wave lengths of light which kill bacteria. The sparks of various metals were used as sources of ultraviolet light, except in a few experiments when it was necessary to take advantage of sunlight because of its greater intensity. In most of the work, a quartz spectrograph was used. The absorption spectrum of a bacterial emulsion was correlated with the limits of the bactericidal action of light. The effect of temperature and the influence of hydrogen ion concentration upon the limits and velocity of the germicidal action of ultraviolet light were determined. From the results of these experiments the following conclusions are drawn:

1. "The bactericidal action of light is confined to the ultraviolet region of the spectrum beginning at 350 $\mu\mu$ and extending with increasing intensity to the shortest wave lengths measurable with a quartz spectrograph: 185.6 $\mu\mu$.

2. "These limits coincide with the absorption of ultraviolet light by bacteria.

3. "The temperature coefficient for the bactericidal action of light was found to be 1.05 over a range of 10° centigrade, and the constant in the formula of Arrhenius was 934 to 975.

4. "An increase in hydrogen ion concentration of the fluid in which bacteria are suspended during their exposure to ultraviolet light increased the velocity of the bactericidal action. The accelerating effect began at 4.6, hydrogen ion concentration, the isoelectric point, and was very strong in fluids more acid than this.

5. "Neither temperature nor the hydrogen-ion concentration rendered bacteria sensitive to the longer wave lengths of light."

The Effect of Radiation with the Mercury Vapour Quartz Lamp. E. Margaret Hume. The Lancet 203: 1318, December 23, 1922.

THESE rats were fed a diet deficient in vitamin A. The general conclusion drawn is that irradiation under these circumstances prolongs normal growth and the "amount of normal growth produced as a result would appear to be roughly inversely proportional to the length of time any individual rat has previously been on the vitamin A deficient diet."

The Effect of Radiation with the Mercury Vapour Quartz Lamp. H. Goldblatt, M.D., *and* K. M. Soames, M.Sc. The Lancet 203: 1321, December 23, 1922.

THIS in an account of experimentation upon rats fed a diet deficient in the fat-soluble, growth-promoting factor. It is a preliminary study which so far leads to the conclusion that "radiation with the mercury-vapour quartz lamp cannot act as a substitute for the fat-soluble, growth-producing factor which is a necessary element of the diet."

Are We Positive in Our Diagnostic Solutions of Our Radiograms and Are We Conscientious with Our Patients? J. Callaway Houchins, D.D.S. Dental Facts 10:88, December, 1922.

IN THIS paper the author severely censures the many members of his profession who "merely commercialize with the x-ray." He says it is appalling to know the number of dentists using x-ray machines and reading their own films who can recognize only the grossest pathology such as poor root canal work, broken roots, etc.

If dentists are to have the respect of the medical profession they must prove themselves worthy of it. He says that "only perseverence, honesty and conscientiousness can bring our profession to its greatest possibilities."

A Few Thoughts on X-rays. George Parker, L.D.S., England. Dental Facts, 10:90, December, 1922.

LOOKING to the future the author expresses the hope that "the dental physician" will have recognized authority in all pathological conditions in and around the mouth. He will have a knowledge of dental surgery, but greater still will be his knowledge of those subjects which must be intelligently understood in order that radiographs may be read correctly.

"Those who nowadays are making the x-ray one of the most abused fads deserve every censure, for, by their conduct, they will bring radiography into ill-repute, and from the housetops it may be proclaimed that a radiologist is a delusion and a fraud, and the result will be that the x-ray machine will be cast aside—mere lumber for the store room. * * *

"Experience and intelligence of the operator, backed up by an intimate knowledge of the radiographic appearances of normal and abnormal conditions and the changes that these conditions may produce in the parts under observation are absolutely essential for a correct interpretation. * * * Let us be candid over our mistakes; that is one of the best ways of learning."

Roentgen Therapy in Dentistry. John L. Garretson, D. D. S., Am. J. Roentgenol. 9:740, November, 1922.

INFILTRATION of the lymphatic tissue of the peridental membrane and the gums is the greatest factor in recurrent infections from pyorrhea. If metabolic conditions are at low ebb the tissues may be unable to throw off the infection and it becomes deeply rooted.

The author has found that if these lymphatic areas are treated by x-ray that absorption takes place and that pressure is relieved and the tissues recover. However, he is very emphatic in his warning that no dentist, unless thoroughly familiar with the vital factors concerned in x-ray practice, should attempt this treatment.

The technique which he employs is based upon the mathematicla formulae outlined by Witherbee and has been fully described in the *Dental Cosmas* of November, 1921.

Swelling from jaw infections, pain and soreness of parts, as well as neuritis of long standing, have apparently been greatly influenced by this form of therapy.

Remarks on Hodgkin's Disease. James Galloway, K.B.E., C.B., M.D., London. Brit. M. J. 2: 1201, December 23, 1922.

THE late Sir James Galloway previous to his death was preparing a lecture upon the subject of Hodgkin's disease the notes of which, after his death, were embodied in the article cited above and here reviewed.

The fever and the cutaneous signs of Hodgkin's disease are discussed in separate sections of the paper and treatment is discussed in the last section.

As to treatment he says, "There is still too much truth in the opinion that there is no recorded case of cure or recovery. There are, however, methods of alleviation." These he states are medication by arsenic or treatment by the x-rays which he credits with having "brought about a great improvement in the symptoms and much comfort to the patient."

X-ray Treatment of Thyrotoxicosis. I. S. Trostler, M.D., Illinois M.J., 43:64, Jan., 1923.

TYPES, tests, and treatment are described here. The author favors x-ray therapy for the following reasons: No harm can result, while many cures are wrought and many other cases are relieved; there is no operative risk, no loss of time, no scar, and no nervous strain such as operation involves.

The effect produced by x-ray treatment is like the one produced by ligating the arteries, only it is minus the

complications of that procedure. Besides this effect upon the blood vessels raying produces a sedative action upon the gland cells.

Treatment of the thymic area is considered essential in all cases of Basedow's disease. Rest, medication, and hygienic measures must all be used in connection with radiation.

Toxic goiter is "a disease of increased basal metabolism." The basal metabolic rate is more constant than temperature, pulse or respiration and is a more trustworthy index of changed or deranged function.

The Roentgen Diagnosis of Mastoid Disease. F. L. Schumacher, M.D., Pennsylvania J. Roentgenol, 4:8, October, 1922.

THE various types of mastoids are here described. The author classifies them thus: (1) *Non-cellular:* (a) undeveloped or infantile, (b) diploetic, (c) sclerotic. (2) *Cellular or pneumatic:* (a) small celled, (b) large celled, (c) mixed celled; this second division Cheatle classifies as (a) pure pneumatic, (b) mixed pneumatic and infantile with the pneumatic structure predominating, (c) the double-decked.

These various types are all described in detail too profuse to abstract, but very valuable in the original.

Benign Neoplasms of the Larynx. John A. Cavanaugh, M.D., Illinois M. J., 43:59, January, 1923.

THE lack of painstaking care in laryngeal examinations is amazing, according to this author. The indirect method of examination, while it requires patience, is a simpler, easier and better method of examination than is the direct method.

The etiology, symptoms and treatment of the various types of benign laryngeal neoplasms are discussed.

Regarding radiotherapy he says, "Radium has had its trial with pros and cons, and like all new methods must have its disappointments as well as its successes, for time alone can prove its usefulness. * * * The use of x-ray treatment in this condition has been disappointing, but the new high voltage x-ray may prove beneficial." He warns against its use by those ignorant of its physical laws.

Estimation of Cardiac Volume by Roentgenology. C. R. Bardeen, M. D., Am. J. Roentgenol, 9:823, December, 1922.

IN THE diagnosis and treatment of cardiac conditions the x-ray offers valuable service in the estimation of size and in the study of the effects of drugs, rest and exercise upon the heart.

There is a value in the knowledge of cardiac volume and the more accurate the method of determining heart volume the more valuable does this knowledge become.

That volume can be accurately determined by the usual comparative methods, or that a relative size can be determined by apex beats is disputed and refuted by this author. Roentgenology does offer the needed accurate and reliable means of ascertaining the size of the heart in the living subject.

As to particular x-ray methods of obtaining this and other information the fluoroscope and orthodiascope are invaluable for various purposes, but the teleroentgenogram is to be preferred for estimation of heart size.

The requirements of distance, position, and exposure are given and very complete directions are then given for accurate determination of size from the shadow obtained.

The Roentgenological Study of the Pathological Gall-Bladder. B. R. Kirklin, M.D., Am. J. Roentgenol, 9:713, November, 1922.

TO SEARCH merely for gall stones instead of direct or indirect evidence of gall-bladder pathology is to neglect one's full duty in an abdominal case. A half-hearted, doubting search for pathology will not be thorough and, hence, will often pass over important evidence.

A gall-bladder shadow is indicative of pathology, which may be with or without stones, for a normal gall-bladder casts no shadow. Other symptoms are pressure upon the duodenum or upon the antrum of the stomach, or displacement of the jejunum or colon, or there may be deformity due to adhesions.

Gall-bladders palpated at operation and pronounced normal by the surgeon have been known to show pathology when, upon the strength of x-ray evidence, they have been opened.

The author describes his technique and especially emphasizes the importance of absolute stillness on the part of the patient, as this is necessary to secure the wealth of detail of soft structures necessary for diagnosis.

Ulcer of the Stomach and Duodenum. Dudley Roberts, M.D., J.A.M.A., 79:2226, Dec. 30, 1922.

THIS paper discusses the dependability of roentgen ray and symptom diagnosis of ulcer, the prognosis of ulcers from the roentgenologic standpoint, the results of medical and surgical treatment of ulcer from the roentgen ray standpoint, and the paper is thus summarized:

"The frequency of peptic ulcer has been greatly under estimated, and the relative danger of the lesion greatly exaggerated, because only the more severe and complicated cases have come under observation or have been recognized through clinical study.

"Until we know more definitely the cause of the lesion and the reasons for its stubborn persistence, we can hardly hope for a specific cure and a satisfactory routine for the handling of these cases.

"Meanwhile, treatment must be individualized on the basis of site and the character of the lesion as shown by roentgen ray study; the subsequently demonstrated change in the lesion; the amount of disability; and the presence of complications such as hemorrhage, perforation and stenosis. But, in addition to all these considerations, in reaching a decisions as to a plan of treatment, we must give due regard to the life expectancy in the individual patient, and the economic necessity for absolute rather than temporary symptomatic cure, which is the frequent limit of medical therapy.

The Treatment of Malignancy by Radiation. W. W. Wasson, M.D., Colorado Med., 19:257, December, 1922.

THE process of x-ray and radium therapy from its beginning is here sketched and the known factors in general radiotherapy are explained in a very simple and logical manner, without over-enthusiasm, but with staunch support of what the author's experience has taught him is true.

Multiplex Pathology and the Cancer Problem. William Seaman Bainbridge, M.D., Illinois M. J., 43:20, January, 1923.

THIS review of the history of our pathological knowledge of cancer covers the main outlines of that history from 200 B. C. to 1922 A. D.

In spite of the many discouraging aspects of the present situation as regards the cancer combat the author looks to the future with optimism.

New Light on Gastric Peristalsis. Walter C. Alvarez, M. D., Am. J. Roentgenol, 10:31, January, 1923.

FIFTY years ago heart murmurs were about the only sign by which heart pathology was recognized. Today tremendous advance has been made in knowledge of heart movements and volumes have been written upon the subject. But the knowledge of gastric peristalsis ends today where that of the heart stood fifty years ago. "Gastroentgenologists have gone on simply looking at the stomach." Until they begin to study the delicate movements of the stomach no further advance in

knowledge will be made by them, in the opinion of this writer, but the great technical difficulties in the way of such study will have to be overcome by the introduction of specialized apparatus before much can be accomplished. The author has one such piece of apparatus upon which he has been working since 1914. The results of his work he sums up in the following summary to his article:

"Gastric physiology is far behind cardiac physiology today, because it has remained very largely in the crude stage of dependence upon unaided visual observation. Methods are now being devised for obtaining multiple and simultaneous mechanical and electrical records of the activities of the stomach and bowel. A few records have been obtained of the human electrogastrogram. The electrograms from the digestive tract look very much like the corresponding mechanogram. New evidence has been obtained as to the location and behavior of the gastric pacemaker. Stomach blocks and dissociations have been observed. Cole's discovery of gastric systoles has been confirmed. Several types of peristalsis are described, and some contractions are shown which might perhaps be called, by analogy, pyloric extra-systoles. Two or three different types of contraction can take place simultaneously in one segment of the stomach much as they do in one segment of the bowel. There is a close relation between the activities of the pyloric end of the stomach and the duodenum. It is hoped that the new studies will eventually help the physician and the roentgenologist to recognize and interpret symptom-complexes, much as the polygraph and the string galvanometer have helped the heart specialist to recognize the auricular fibrillation or heart block from the history, or from the feel of the pulse."

Intestinal Reaction to Erythema Dose. Charles L. Martin, M. D., *and* Fred T. Rogers, Ph.D., Am. J. Roentgenol, 10:11, January, 1923.

THE experimental work here recounted was done upon dogs. Loops of the intestine were laid out upon the outside abdominal wall and the viscera thus exposed rayed with a 5-inch parallel gap, target skin distance 10 inches, 10 ma. of secondary current, and with no filter except a thick piece of paper. The abdominal wall and the intestine thus received the same quantity of rays. The wounds were then closed and observations were carried out which lead to the following conclusions by the authors:

"(1) The skin of the dog is much more resistant to roentgen rays than is the skin of man. (2) The minimum erythema dose for the dog's skin when applied directly to the dog's intestine produces hyperemia, marked contraction in all directions and destruction and desquamation of the mucosa. (3) Bloody diarrhea, ulceration, perforation, and stenoses occurring in patients subjected to ultra deep therapy for abdominal tumors may be due to direct intestinal injury. (4) Roentgen cachexia is possibly due to the same cause. (5) Intestinal damage in dogs, resulting from direct radiation, does not always produce an early death."

Newer Investigations of the Problem of Roentgen Ray Dosage. Otto Glasser, Ph.D., Am. J. Roentgenol, 10:1, January, 1923.

THIS paper and one by Friedrich which immediately follows it constitute a general discussion of the problem of roentgen ray dosage combined with a report of the investigations of Friedrich and the author.

The problems of absolute dosage and of practical dosage are specifically discussed by Dr. Glasser in this paper. Friedrich's method of measuring dosage is described and contrasted with that of Holthusen and apparently different conclusions have been reached by the same men, differences which are only apparent, however, as the following discussion will show. Dr. Glasser says: "To sum up: It is evident that in the construction of biological rules determined by small ionization chamber measurements, it is necessary to make certain corrections, whether the ion theory or the energy theory is employed.

"As a matter of fact, series of such biological rules are in existence, on the one hand, from the ionization standpoint, and on the other, from the energy standpoint; the first group is fairly represented by Kroenig and Friedrich, and the second by Holthusen."

Holthusen came to the conclusion "that the biological effect was independent of the wave length over a definite scale of wave lengths, when he applied a definite correction factor, and by this means calculated the ionization currents in terms of energy. In contrast to this, there was a distinct difference in biological effect, when measured by the ionization current alone. Kroenig and Friedrich used large test objects and dosed by the ionization current measurements. It is evident * * * from our investigations that the additional effect of the scattered radiation approximately equals the correction factors employed by Holthusen for estimating the energy of the secondary beta rays. As a result of this, the direct readings by Kroenig and Friedrich automatically supply the right correction, and the applied dose is the same as by the energy theory."

Thus, the apparent and much discussed discrepancy between the conclusions as to biological effects reached by these two groups of workers is seen to be explained by the scattered radiation.

Ionization Measurements. Gioacchino Failla, E.E., Am. J. Roentgenol, 10:48, January, 1923.

"IONIZATION measurements of radiation for therapeutic purposes are reliable, provided the quality of the radiation and the distribution of the ionization in the chamber are not very different for the different measurements. The instrument should be properly designed and constructed as regards the type of ionization chamber, insulation, electrical shielding, screening from extraneous radiation and saturation. It should be calibrated every day, or oftener if a change is suspected, by means of a radium standard."

The Problem of Ray Dosage. Prof. W. Friedrich. Am. J. Roentgenol, 10:6, January, 1923.

THIS is a discussion of the physical factors involved in dosage. The theory of dosage is the first topic discussed, followed by a discussion of scattered radiation, the general problem of dosage, practical (relative) dosage, and apparatus.

Physicist, chemist and biologist must cooperate to build the foundation for the solution of the problem of absolute dosage. The physicist has done his part for the present in the solution of the problem of practical dosage and its further solution depends upon the clinical investigator.

For practical dosage sensitive and reliable apparatus is requisite and the various apparatus for ionization measurement are discussed from the standpoint of physics. "The construction of the ionization apparatus has reached such a degree of simplicity that it may be completely used by those who are not physicists."

Discussion on X-ray Treatment of Deep-Seated Cancers with Special Reference to Erlangen Methods: (I.) J. R. Riddell, F.R.F.P.S., Glas., L.R.C.P., L.R.C.S., Edin.; (II.) J. H. Douglas Webster, M.D., Edin., Ch.B., M.R.C.P., Edin.; (III.) F. Hernaman Johnson, M.D., Aberd., Brit. M. J., 2:506-510, September 16, 1922.

DR. RIDDELL says that the essential differences between the Erlangen method and the older method are that the object of the Erlangen method is "to attain homegeneity in the rays

used, to administer an equal dose to all disease tissues and to do so at one sitting."

The U.S.D. (unit-skin-dose of Seitz and Wintz) is that quantity of radiation which will produce a faint redness of the skin one week after treatment and a faint tanning one month after treatment. The "castration dose" is 34 per cent of the U.S.D.; the sarcoma dose is 70 per cent; the tuberculosis dose is 50 per cent; the carcinoma dose 110 per cent; 135 per cent of the U.S.D. will damage normal bowel tissue and 180 per cent will damage normal muscle tissue.

The technique of treatment with these dosages is described, as is the technique whereby homogeneity of rays is attained.

A number of cases treated by the author during the period from June, 1921, to May, 1922, are described with the present results tabulated. The author considers that the immediate effects are striking and he is hopeful of the future of this method.

Dr. Webster discusses the problem from the physical, biological and clinical standpoints. He says that there is too little comprehension of the fact that types of cancer differ greatly from each other. "To the histiologist it is almost as unilluminating to talk of 'deep-seated cancers' as a group as to talk to an ethnologist of 'Asiatics'; the types of cancer differ much more from one another than, say, the Sikhs and the Malays! Ewing says, 'It may be safely said that there are more distinct clinical and pathological entities within the groups of neoplasms than exist outside of them.'"

He goes on to say that, "Pathologists are naturally sceptical when terms like 'cancer dose' are used without qualification; 'carcinoma dose' may be used as applying to superficial malignancy, certain gynecological primary growths, and to mammary secondary deposits * * * but to apply the term 'lethal dose' to other conditions such as gastro-intestinal carcinoma or primary breast tumors as a whole is an unwarranted reasoning from the particular to the general.'

He says that he cannot dispute the clinical findings as to the benefit of preliminary ionization with copper selenate (used at Erlangen) but he disagrees with the theory of it, basing his opinion chiefly upon Dr. Turrells experiments which have shown that "the blood and tissue fluids rapidly disperse any inflowing ions."

Radiation from a great distance (up to a metre) he would abandon and prefers the interposition of paraffin or water.

Scaled sectional drawings constitute the only accurate method of orienting fields and perfect accuracy is not always obtainable by any means, as the biological factors involved elude physical powers of measurement. The typical Erlangen technique "applies only to stout Bavarian patients."

The interval between doses must depend upon the type and speed of growth and also upon the general condition of the patient.

"The whole subject is thus seen to be one in which as yet sure conclusions are hard to find." However, he praises results already accomplished and is far from sceptical of the future.

Dr. Hernaman-Johnson says that three factors—direct effect of x-rays upon malignant cells, the reaction of normal surrounding tissue and the general constitutional response of the patient determine what the results of the treatment will be in any case.

The doctrine of the "single lethal dose" is flouted by him. He says, "One hears of precautionary doses after six weeks and of yet further 'precautions' at later dates. But if repetitions every six weeks why not every six days?"

The doctrine of the "small stimulating dose" he also flouts. He himself has patients with inoperable or recurrent breast cancer who have received treatment with a voltage limited to 160,000 and who are "going about their affairs five years now after the original occurrence." The effect upon the blood and the general resistance of the patient has kept him from using the single massive dose in any case of carcinoma of the breast.

"The last thing I want to suggest is that the x-ray treatment of breast cases should be undertaken by amateurs or that research should not vigorously be prosecuted. But when a man has been getting good results for years with an ordinary outfit in a hospital which is not able to afford a high voltage apparataus, he should not be frightened into giving up because of the doctrine of the stimulating dose."

He regards the results of the Erlangen method as excellent and believes it is full of promise but he gives full credit to methods long in use in England.

Choice of Combinations of Physical Forces in the Treatment of Cancer. G. Betton Massey, M.D. Am. J. Electroth. & Radiol. 11:352, November, 1922.

"RADIUM should be regarded as a local, destructive agency in cancer only, and for this purpose as inferior to immediate electrochemical or electrothermic destruction when the latter is possible or safe. Complete and immediate local destruction of a cancer is preferable to slow, irritative methods of destruction since the latter open up the avenues of internal invasion, and invite increased growth of any remnants of the local cancer during the wound healing reaction. The x-ray remains the best remedy for internal cancer that cannot be removed by the knife."

Salivary Glands in Carcinoma. L. S. Dudgeon, C. M. G., C. B. E., F.R.C.P., The Lancet 203:558, September 2, 1922.

A STUDY of the condition of the sublinqual and submaxillary salivary glands in carcinoma of the tongue and the floor of the mouth is here presented. Seventy-eight cases were studied in which both the primary growth and salivary and lymphatic glands were examined microscopically. These cases were grouped clinically into (1) early cases with the tongue still mobile and the infiltration slight; (2) carcinoma of the floor of the mouth and late cases of carcinoma of the tongue with the latter fixed and muscles extensively infiltrated; (3) cases of carcinoma of the lip.

The author concludes thus: "In the vast majority of cases of carcinoma of the tongue and the floor of the mouth the salivary glands are not the seat of carcinoma. * * * In nearly all cases the changes present in these glands are of a chronic inflammatory nature, somewhat analogous to the changes met with in the pancreas in chronic pancreatitis, and apparently due to infection from the mouth along the ducts. In other cases no microscopic change can be seen. * * * The lymph nodes in this area show malignant changes in only 27.3 per cent of early and 50 per cent of late cases, though inflammation is always present. It would appear therefore in certain cases with early carcinoma of tongue to be justifiable to leave the submaxillary area untouched at operation, though clinical experience teaches that the risk of the subsequent appearances of metastases is very great."

Carcinoma of the Lip and Cheek. George Emerson Brewer, M.D., F.A.C.S., Surg. Gynec. & Obst. 36:169, February, 1923.

THE general principles involved in operations and results obtained at the Presbyterian, Memorial, and Roosevelt hospitals in New York City are discussed in this paper.

Discussing the use of radium in these cases the author says that during the last six or eight years such advances have been made in radiotherapy of this lesion that results are far in advance of anything which was hoped for ten years ago.

In the General Memorial Hospital during the last seven years there have

been 27 per cent of three year cures, 14 per cent of four year cures, and 11 per cent of five year cures among the 200 or more cases of cancer of the lip referred for palliation only; of the 61 cases of cancer of the cheek treated by radium in this hospital there is here reported 35 per cent of three year cures.

The author says: "From the statistics of this report which I believe to be accurate, it will be seen that the results of surgical treatment of the lip are far superior to those obtained by radium, and that we are not justified at the present time in advising radium treatment in early operable cases. On the other hand, in cancer of the cheek, the results by radium are so evidently in advance of those obtained by operation, that until it can be demonstrated by a series of well observed three or five year cases, that operation gives equally good results, all cancers arising in the mucous membrane of the cheek should be treated by radium."

Our Faults in Writing. California M. J. 21:33, January, 1923.

THIS is a series of quotations taken from the United States Naval Medical Bulletin and reporting an address given by Dr. George H. Simmons, editor of the Journal of the American Medical Association. Thirty years in medical journalism have qualified Dr. Simmons to speak with some knowledge of his subject.

The length of an article is a matter of relativity—"A paper of 500 words may be long; one of 5,000 words may be short."

Lack of a logical plan, verbosity, and discussion of non-essential details ruin many an article. As a remedy Dr. Simmons suggests the use of cross headings and numerous revisions of the text during every one of which it will be found possible to eliminate many words, phrases, sentences, and sometimes whole paragraphs.

Allbutt and Osler among medical writers, and Lafcadio Hearn among lay writers are mentioned as men who attained their perfection of charm by the most painstaking and patient revision of one copy after another. Even up to his death this was Osler's method. If the master writers found this necessary, Dr. Simmons asks, should lesser lights feel any humiliation in putting it into practice?

Diagnosis and Treatment of Carcinoma of the Cervix. Wm. Neill, Jr., M.D., W. Virginia M. J. 17:258, January, 1923.

THERAPEUTICALLY speaking, cases are classified thus: "Early operable cases where the disease is limited entirely to the cervix; second, borderline cases, those with vaginal wall involvement and thickening in the parametrium; third, local inoperable cases with huge cervical growths and fixation of the parametria on one or both sides; fourth, cases with general metastases."

The mortality rate and the proportion of cures resulting from surgery are directly proportional to the duration of the lesion and to the size of the area involved. Removal of a local cervical growth by cauterv or curet makes conditions worse.

Radium gives no mortality in any group and gives a large number of permanent cures in borderline cases. In the third group the percentage of immediate relief is high and may persist for years but clinical cures are only of a few years duration. In the last group palliation is all that can be hoped for.

Pre-operative radium therapy is favorably regarded for early cases—the increased difficulties of operation resulting therefrom can be avoided by a change in surgical technique. Immediate postoperative radiation is dangerous, as sloughing or fistula may result from it. Radiation from the surface of the body is never used alone in cervical cases unless extensive metastases exist.

In concluding the author says that in early operable cases where the disease is limited entirely to the cervix either radium or surgery alone is justifiable. In late operable cases he advocates radium locally over the growth and externally over the pelvis. In advanced cases he would use radium alone, locally or by implantation of bare radium emanation points.

Statistics and Technique in the Treatment of Fibromyoma of the Uterus by Radiotherapy. James A. Corscaden, M.D., Am. J. Roentgenol. 9:812, December, 1922.

THE information upon which this paper is based is derived from 250 cases treated at the Presbyterian Hospital, New York City. Two hundred and three of these cases have been treated during the period which began in June, 1914.

The paper discusses technique from the general standpoint and the procedures used in the treatment of fibromyoma of the uterus and hemorrhages from other benign causes.

The manifestations of the normal and the artificial menopause, psychoneurosis in particular, are quite fully described.

The author's conclusions are that (1) Radiotherapy of a myomatous or grossly normal uterus will stop all bleeding not due to ulceration and will cause a myoma to shrink more or less rapidly, also it will stop dysmenorrhea. (2) Radiotherapy will give only partial results in the relief of pain not associated with menstruation and in urinary distress. (3) As a result of the artificial menopause from radiotherapy hot flashes are the rule and there is in some patients an increased nervous irritability. In the majority of patients, however, nervousness diminishes, probably as a result of improved general well being. On the other hand those patients who are suffering from nervous disorders may be made worse. He remarks further that sexual changes are negligible, and that normal pregnancy is possible after temporary menopause. Blood pressure studies he regards as unreliable. In 16 per cent of the cases treated there seems to be an elevation of blood pressure.

What Is the Best Method for the Treatment of Uterine Fibromyomata by Means of the Roentgen Rays? M. Beclere, M.D., Paris. Am. J. Roentgenol. 9:797, Dec. 1922.

THE French and German theories regarding the action of x-rays upon the uterine fibromyoma are here contrasted. The Germans regard this treatment as an appendage to ovarian sterilization while the French believe that it forms a separate chapter in roentgen therapy. The Germans take the ovaries as the target while the French ray the entire uterine tumor without especial attention to the ovaries.

The author believes that the rays act immediately and directly upon fibromyomata of the uterus and that the immediate reduction of the tumor's size is not, at first, due to any change in hormones. He upholds his view by citing the fact that growth, retarded or increased, may and does often take place after the norma menopause.

The German technique of the single castration dose is reviewed. The author does not favor the single dose at one sitting but uses smaller doses weekly and believes that this method offers "better assurance of the progressive destruction of the neoplastic tissues" with total destruction of the ovarian follicles. Also these weekly sittings give better opportunity for observance of the patient's progress and he stresses the importance of watchful supervision and the proper appreciation of the physical aspect of the patient's condition. Often the proper word at a critical time will determine the course which the case will take. Irradiation malaise is likewise prevented by this method, and this should always be prevented if at all possible. The author does not regard it as a thing of trivial moment.

Each method, of course, has its advantages and its drawbacks, and each has its different requirements. "The judicious employment of a pliable method which can be adapted to the exigencies of each particular case is

always preferable to the blind acceptance of a uniform formula."

Pregnancy after either form of treatment the author believes cannot be hoped for, although one or two cases have been cited in the literature.

Radiotherapy of Uterine Bleeding. William H. Schmidt, M.D., Am. J. Electroth. & Radiol. 11:347, November, 1922.

AS A GUIDE to the selection of cases for radiotherapy the author gives the following: "(1) All tumors less than a four months pregnancy may properly be treated by radiotherapy. (2) All tumors not complicated with inflammatory condition of the adnexa may be treated with radiotherapy. (3) All tumors producing pressure demanding prompt relief or associated with pregnancy are surgical, but if pressure symptoms are not urgent it is justifiable to use radiotherapy. (4) All tumors showing distinct malignant changes had better be treated by radiotherapy first and followed by surgery. (5) Any case refusing operation or in poor physical condition justifies the use of radium or x-ray, except when complicated with inflammation of the adnexa or pregnancy." Debatable cases are those with complications unrelated to the uterus or adnexa among which are mentioned gall-bladder infections, stones, appendicitis, pathological changes in the kidneys, gastrointestinal lesions, perineal lacerations, fistula, hemorrhoids. Debatable also are cases of suspected malignancy or those where malignant degeneration is feared.

The author draws the following conclusions: "There is only a limited class of fibroid which belongs distinctly to the surgeon while the usefulness of radiotherapy is being extended. Idiopathic metrorrhagia at any age is purely a case of radiotherapy. Radium or x-ray will produce its same good effects and each must be employed according to its indication in each individual case. The mortality of radiotherapy is practically nil, while its economic factor, safety, freedom from discomfort, and large percentage of good results are greatly in its favor. Success depends upon proper technique and judgment and the selection of the best agent—radium or x-ray—suited to each individual case."

The Preoperative, Routine, Roentgenographic Examination of the Chest in All Cases of Breast Conditions. J. W. Frank, M.D., Pennsylvania J. Roentgenol. 4:4, October, 1922.

MANY physicians and surgeons do not secure an x-ray plate of the chest before operation of the breast but this should always be done for it will often reveal an unsuspected metastatic growth and amputation can produce no good result if there is an infiltration into the mediastinum or the lung.

The lymphatic system of the breast as described by Ewing's *Neoplastic Diseases*, 2nd edition, is reviewed in considerable detail after which the "why" of different lines of metastases is discussed.

Treatment of Carcinoma of the Breast by Radiation. Z. A. Johnston, M.D., Pennsylvania J. Roentgenol. 4:1, October, 1922.

OPERATION should be done in every early operable case. Anteoperative radiation is advised for the reason that it will reduce the amount of malignant tissue to be removed at the time of operation and will lessen the danger of local implantation.

These cases should have one complete series of deep x-ray treatments, with cross-firing around the axilla, supra-clavicular region and mediastinum. Packs of radium are used over the growth and in the axilla if there is any suspicion of glandular enlargement. Three weeks from this time radium needles are imbedded in the growth and three or four weeks later the case is turned over to the surgeon. A month after the operation a second course of treatment is administered. "No set rule as to treatment can be followed. A general plan of treatment can be modified for each individual case."

Border-line cases the author says are the most abused. Only one out of five of those with axillary enlargement can hope for lasting cure but thorough competent radiation increases the percentage of cure.

Hydatid Cyst of the Lung. Gerado M. Balboni, M.D., Boston M. & S. J., 187:879, December 14, 1922.

THIS paper reports two cases in one of which x-ray treatment was tried. Symptoms of hydatid cyst vary and they may simulate any pulmonary infection. The patient will not be conscious of any trouble until the cyst ruptures or the lung becomes inflamed or congested. "When rupture occurs into the lung structure the appearance closely resembles that of a lung abscess. The borders of the lesion are no longer sharply defined and the pleura may be involved, producing a marked limitation of the respiratory excursion of the diaphragm on the affected side."

The x-ray is the chief aid in diagnosis. Whenever possible surgery is the treatment, there is no medical treatment. X-ray was tried in one case but no improvement in symptoms or change in x-ray findings occurred.

Observations on Lung Suppuration and Its Treatment. W. Meyer, M.D., Arch. Surg. 6:361, January, 1923.

THIS paper deals principally with the nomenclature of lung suppuration, the results obtained with the help of the bronchoscope, and the establishment of a lung lip fistula in certain cases of bronchiectatic lung abscess.

Included in his discussion of diagnosis the writer has the following to say of the roentgen ray diagnosis of this lesion: "Sterescopic roentgenograms present a beautiful plastic picture of diffuse density, but often fail to assist the surgeon in making the diagnosis of typical bronchiectasis. They are, however, of much value in cases of the typical lung abscess, as well as of the bronchiectatic lung abscess. Here they often demonstrate clearly the presence of one or more larger or smaller cavities, with a distinct fluid level.

"Much remains to be done, it seems to me, by roentgenologists in this type of disease. They must learn not only to determine the presence of an abscess, but also to localize more accurately the focus, and, if possible, the exact location of adhesions betwen the pulmonal and costal pleura. True, now and then they succeed in localizing correctly the seat of the trouble, telling us how many inches we have to measure from the spinous process of the seventh neck vertebra down, and how many from there to the right or left side, in order to find the spot where the aspirating needle should enter and strike the abscess. But these cases, up to date, are exceptions; and we are not advised so far at what depth we are likely to enter the cavity, how many inches below the surface of the thorax we may expect to find it.

"It is to be hoped and greatly to be desired that roentgenologists will devote further thought and investigation to this subject, in order to give the surgeon the real assistance which he needs when proceeding with his operative work on conservative lines."

Radium in the Treatment of New Growths of the Male Bladder. William Neill, Jr., M.D., J. A. M. A. 79:2061, December 16, 1922.

THE technique of this treatment is described. Treatment of tumors through the cytoscope must be limited to cases in which all parts of the growth can be clearly seen and outlined, otherwise suprapubic exposure should be employed.

The author reports perfect healing without complications.

Value of Gas Inflation in X-ray Diagnosis. F. Hernaman-Johnson, M.D., Brit. M. J. 2:511, September, 1922.

THE uses and risks of peritoneal inflation, the importance of careful

technique and the method of perirenal inflation introduced by Carelli of Buenos Aires, are the topics treated of in this paper.

Of this last procedure the author says that it is most difficult. He gives detailed directions for its use and illustrates the points of his description by an anatomical drawing and by a sketch of the apparatus in use.

The Choice of Pyelographic Mediums. Roger C. Graves, M.D., *and* Leo M. Davidoff, M.D., J. A. M. A. 80:168, January 20, 1923.

THESE authors believe that the use of 25 per cent sodium bromide is as unwise as it is potentially harmful. Its hypertonicity "in the presence of increased pressure may cause sufficient edema of the renal pelvis to occlude its outlet and so produce the picture of colic chills and fever, which too often follows pyelography." A 12 per cent sodium iodid isotonic with 8.2 per cent sodium bromid is the solution which they themselves use.

Cases for pyelography should be carefully selected. The patient who has extensive infection and depressed renal efficiency should be examined with great caution. A pyelography in an ambulatory case is not advised.

The catheter should be advanced to the upper ureter or pelvis but not far enough to cause bleeding or pain. Drainage of the pelvic contents should be made and the medium then slowly injected, else pain will result. "The danger of high pressure within the bladder or renal pelvis cannot be overemphasized." The practice of waiting for pain to manifest itself before suspending injection is condemned. It is better to inject 7 to 10 cc. and then take a plate to determine the amount of further filling necessary. After examination the fluid should be withdrawn, and forced fluids, rest, and urinary antiseptics prescribed for the patient's comfort.

Important Points in the Technique of Roentgenological Examinations of the Urinary Tract. Bernard H. Nichols, M.D., Am. J. Roentgenol. 10:19, January, 1923.

DURING the last twenty years there has been an increasing accuracy in the diagnosis of diseases of the genitourinary tract and this is largely due to the introduction of the cytoscope and the procedure of peritoneum.

The author insists always upon complete examination of the entire urinary tract, and he says that catheterization of the ureters with an opaque catheter will not suffice in examinations but ureterograms should be taken. Examination must be made in the horizontal position as well as standing, as in the latter position there is always danger of the liquid passing too rapidly into the bladder. Also he considers a convenient and practical table with a Potter-Bucky diaphragm absolutely essential for this work.

Experimental Cancer. Brit. M. J. 2: 1101, December 9, 1922.

A SERIES of papers upon different phases of the above subject are published in the journal cited above.

The first article is a short resume by J. A. Murray, M.D., of the literature upon "The Production of Cancer by Specific Forms of Irritation."

The title of the second paper is "Paraffin Cancer and Its Experimental Production," and its author is Archibald Leitch, M.D. Cutaneous cancer is here reported as occurring in paraffin workers in the oil-bearing shales of the West Lothian district of Scotland. Also this paper reports tumors produced in mice by repeated applications of crude shale oils. The article is bountifully illustrated with clinical photographs of workers as well as with illustrations of the experimental work recounted here.

Alexander Scott, M.D., presents a paper "On the Occupation of the Paraffin and Oil Workers of the Scottish Shale Oil Industry." He reports that epitheliomas occur among workers past middle life who have spent twenty years in this industry, but that long service in the industry stamps every patient.

These epitheliomas first appear as warts of benign nature. "The usual appearance is that of a gradually growing epithelioma in the midst of a chronic indurated dermatitis with numerous simple warts or indurated warty papules, only one of which has become malignant."

T. M. Legge, M.D., discusses the prevalency of "patch warts" among patent fuel workers. His article is entitled, "Epitheliomatous Ulceration in Industry" and is greatly condensed into tabular form. He reports that the percentage of warts which require treatment is comparatively small.

"The Experimental Production of Cancer by Arsenic" is the subject of a paper written jointly by Archibald Leitch and E. L. Kennaway, M.D. Rats and mice were used in these experiments which resulted in the production of cancer upon the exact spot where arsenic had been directly applied to the skin.

Further experimentation is contemplated by the authors, who, however, regard the evidence of cancer being produced in man by long continued labor in arsenical works as insufficient to merit serious consideration.

X-ray Cancer. Cecil Rowntree, F.R.C.S., Brit. M. J. 2:1111, December 9, 1922.

IN 1909 this author's records showed eleven English and nine American cases of x-ray cancer. Four English cases and one American case had terminated fatally previously to 1909. The author now reports three further deaths in England since 1909 (no record of American or other cases than English since 1909). Two new cases have developed in England since that time. This small number the author interprets to mean that preventive means have been successfully employed by workers of later years.

The clinical history of x-ray cancer is usually that of a severe burn followed by the appearance of warts, one of which develops into an ulcer and later on becomes carcinomatous. Often these warts are most innocent in appearance until microscopic examination is made when they are found to be malignant. The most extreme case of metastasis among these recorded cases is one where the growth extended up the arm until finally it reached the chin and lower lip. Four cases had involved the axillary glands, nine others had not done so at that time and seven of these still have not done so after a period of fourteen years since the first growth was removed.

X-ray cancer, the author believes, is of low malignancy and seldom recurs after excision of the first growth. A combination of burn plus a long succession of quite small exposures is necessary to produce this form of cancer. No case of x-ray dermatitis can be considered safe, however, until many years after the last exposure.